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Contractors and Engineers Monthly

Vol. 43, No. 6 JUNE, 1946 $3 a Year, 25 Cents a Copy

Covering the Field

- **Driving Concrete Piles**
  A special pile-driving rig was developed by the contractor to drive 3,242 concrete piles weighing up to 25 tons for new concrete piers at the San Diego Naval Repair Base (page 1).
- **Aggregates for Road Base**
  Caliche was used as road-base material and aggregate for road-mix on a 19-mile highway project in the southwest. A feature of the work was the amount of drilling and blasting required. See page 1.
- **Airport Construction**
  To determine the best base-course material for the runways at the new East Boston Airport, test sections of various materials have been built by contract (page 1).
- **New High Bridge**
  The construction of the highest continuous-steel-deck bridge in the country, carried on tall concrete piers, is described on page 2.
- **Bituminous Paving**
  The first use of machine-laid plant-mix to resurface old roads in Vermont is described on page 6. On page 70 is an article on a contract for placing sand-asphalt base and black-top surface on city streets.
- **County Road Work**
  On page 12, the activities of an enterprising western county highway department are described. The importance of good public relations for county highway departments is discussed on page 33. Decentralization of highway work in a Michigan county aids town road work. See page 53 for how the plan works.
- **Concrete Paving**
  Concrete paving for a 2¼-mile section of a new dual highway was laid on a slag base course. See page 17.
- **Highway Grading**
  In addition to the grading for a new dual concrete highway (page 17), the heavy grading required for a 5-mile highway relocation is described on page 42.
- **Gravel Blanket for Levee**
  Levee along the Wabash River is being improved and strengthened, using a gravel blanket for a horizontal drain. See page 49.
- **Increasing Job Production**
  A safety program which greatly increased job production is described on page 57. Some safety practices which will help you do the same are illustrated on pages 40 and 41.
- **Road Shoulders Seeded**
  Some 5,220 feet of 10-foot sandy shoulders were stabilized, seeded and mulched this spring along two Long Island highways. A feature of this work was the use of a special rig for spraying fertilizer and water over the area (page 61).

(You will find "In This Issue" on page 4)

C. & E. M. Photo
Concrete for precast piles for new piers at the San Diego Naval Repair Base was mixed in a Koehring 27-E paver and poured by a Gar-Bro bucket on a gantry crane. Safety signs helped to keep all on the job safety-conscious.

Crushed Caliche On 19-Mile Road

All Cut Sections Were Blasted; Fills Built to Rigid Specifications for FAP Road-Mix Job

✦ THE roar of dynamite and the rumble of rock crushers have echoed among the oil derricks and range land north of Hobbs, N. Mex., in recent months. A new highway, with shallow cuts and fills never more than 6 feet high, is being built mostly out of rock across the high, level plains of southeastern New Mexico. The predominance of rock in such a level road is not unusual there, for nearly all material under the grassland is caliche or lime rock.

The new highway, when completed, will speed local traffic northward from Hobbs towards the oil fields between that city and Lovington. It will serve

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Contractors Establish New Concrete-Pile-Driving Mark

Heavy-Duty Pile Driver Beats Previous Estimates On 3,242 Piles for New Piers at Navy Base

By RAYMOND P. DAY,
Western Field Editor

✦ PILE-DRIVING records which stood for years as a basis for estimating contract costs have now been increased by almost 100 per cent in San Diego Bay, Calif. Thanks are due largely to a Portuguese contractor, one of the most enigmatic characters of the west, who conceived and designed an improved heavy-duty pile-driving rig. The contractor is Carlos Tavares of San Diego, and Shanghai, China. The job is a new $1,943,000 addition, in the form of two new concrete piers, to the berthing facilities at the San Diego Naval Repair Base.

Whatever are the mysterious secrets in Tavares' inscrutable mind, they always appear in the form of lightning mathematical calculations; radical new departures from the conventional; adventures in the new and untried. The "pile-butts" who have missed not a day from the Tavares payroll since he came to America in the late 1930's all swear by him. Outwardly, Carlos Tavares is almost ridiculously young, and he is affable and polished to perfection. Simply by shrouding a brilliant engineering mind in Oriental mystery, Carlos Tavares has more than once caused west-coast constructors to exclaim, "How in hell does he do it?"

As advances in concrete-pile construction have been made, the size of piles has increased. Their weight has gone up proportionately, of course, and has made necessary the importance of heavier machinery for handling and driving. Pier design has become more daring. Where vertical piles once had been the rule, batter piles began to appear in bents. The culmination of this design trend appears in the present job in the form of two brace piles for each bent, driven on a batter of 5 on 12. Some of these brace piles are 83 feet long and weigh 25 tons. If you are technically minded, calculate the stresses in a set of pile-driver leads in which one of these 83-footers is being driven to that batter. Figure the flotation on the corners of the driver hull. Tavares figured it on a scratch pad, roughed it out, and said, "Build it, boys".

The principal improvements of Tavares' new pile driver are a set of leads 100 feet high, with twin telescoping water jets built in as an integral part of the leads' channel framework. Probing had indicated the presence of a hard formation of shale, so Tavares built a well-drilling rig into the new pile driver also.

Tavares is one of the contracting partners who joined, early in the war, to form Concrete Ship Constructors. The rest of this firm is composed of Elliott-Stroud-Seabrook, an established firm of contractors which has an imposing list of western construction to its credit. Officially the San Diego job was let by the Navy's Bureau of Yards and Docks to Concrete Ship Constructors, T. W. Eisenman, and the Case Construction Co. of San Pedro, on a joint-bid arrangement. Tavares designed the

(Continued on page 73)

C. & E. M. Photo
At the contractor's yard about 6 miles south of San Diego, the precast piles were poured in bays 45 piles long and 10 piles high. Here steel forms are being stripped after a pour.

Runway Test Section Built at Big Airport

Contractor Furnishes Men And Equipment to Work as Engineers Direct; Unique Arrangements at Airport

✦ IN order to provide the best possible runways at the Logan East Boston Airport with available construction materials, engineers from the Massachusetts Department of Public Works have been making a series of tests on base-course sections that have been built to various specifications and designs. From findings taken in these tests, the engineers will draw conclusions as to what type of base course is best suited to conditions at this big airport taking shape in the middle of Boston Harbor. The airfield has been made by pumping clay from the harbor bottom (See C. & E. M., December, 1944, page 2), but on top of this hydraulic fill some sort of base course must be built to support the flexible bituminous paving which will be laid later on this summer.

The Department of Public Works knew what it wanted to do; namely, to construct various kinds of base courses with different materials and by different methods so that the ideal type could be determined. But it lacked equipment and men for this typical contracting operation. Accordingly a unique form of contract was advertised for bids last

(Continued on page 28)

High Highway Bridge Is Nearing Completion

Tall Concrete Piers Carry 1,736-Foot Steel Structure Over the Kentucky River; Cost Over $1,000,000

By WILLIAM H. QUIRK,
Editor

✦ THE highest continuous-steel-deck bridge in the country, carrying U. S. 25 over the Kentucky River south of Lexington, Ky., will be completed this year after slow and irregular progress occasioned by the exigencies of wartime construction. The building of this tall structure, highest highway bridge east of the Mississippi River, was started in October, 1941, two months before Pearl Harbor. It is a tribute to the perseverance of officials of the Kentucky Department of Highways, who conceived this project, that it will be ready for traffic as early as this summer, considering the shortages of men and material at the time of its construction.

The new bridge, 250 feet above the river, has a total length of 1,736 feet and is made up of the following spans, starting at the north abutment: two 50-foot simple reinforced-concrete deck-girder spans; a 192-foot simple steel Warren truss span; a 3-span continuous-deck steel Warren truss, 320, 448, and 320 feet respectively; another 192-foot simple steel Warren truss span; two 50-foot and one 40-foot simple reinforced-concrete deck-girder spans. The trusses are 60 feet deep at the main piers, and 30 feet at the midpoint of the central span; they are set 22½ feet on centers, supporting a 7½-inch concrete-deck superstructure on a 3 per cent grade with a 26-foot roadway and two 3-foot sidewalks. Solid limestone rock furnishes a good foundation for the concrete piers, the tallest of which is 198 feet.

Designed for H-20 loading in accordance with the 1935 specifications of the American Association of State Highway Officials, the new bridge at Cleveland, 16 miles southeast of Lexington, replaces a narrow wrought-iron truss span known as the Clays Ferry Bridge, built in 1869. This old low-level river crossing was flanked by steep tortuous hairpin-curve approaches on 8 per cent grades, which are eliminated by the new structure with a subsequent shortening of U. S. 25 by 1⅓ miles. Four different contractors have been engaged on the construction and approaches of the new, graceful, well proportioned bridge now spanning the deep scenic gorge of the Kentucky River, at a total cost of $1,264,073.23.

Substructure Contract

A contract for the bridge substructure was awarded to the Massman Construction Co. of Kansas City, Mo., on its low bid of $346,339.74, and work on the pier footings started in October, 1941. The abutment and first pier at the south side of the bridge were omitted from this contract; they might be damaged, it was feared, by the heavy blasting required to grade a rock cut in the adjoining approach. They were included in a later contract for the reinforced-concrete approach spans. The construction of the north abutment and eight piers was completed by January, 1943.

All pier footings went down to solid limestone rock and the maximum foundation pressure did not exceed 10 tons per square foot. The footings for the two main piers, 5 and 6, on the banks of the river, are 50 x 30 feet, with depths of 12.4 and 28.5 feet. These piers tower 182 and 198 feet respectively from the bottom of the footing to the cap on top. In constructing pier 6 footing, a cofferdam was made of 50-foot steel sheet piling and braced with steel struts on the three lower tiers of wales; timber was employed for the upper tiers. Two 4-inch pumps dewatered the cofferdam, permitting concrete to be placed in the dry by a derrick with a 157-foot boom; this length was needed before the top of the pier was reached in the pouring. The piers are double columns with a connecting web wall at the bottom and top.

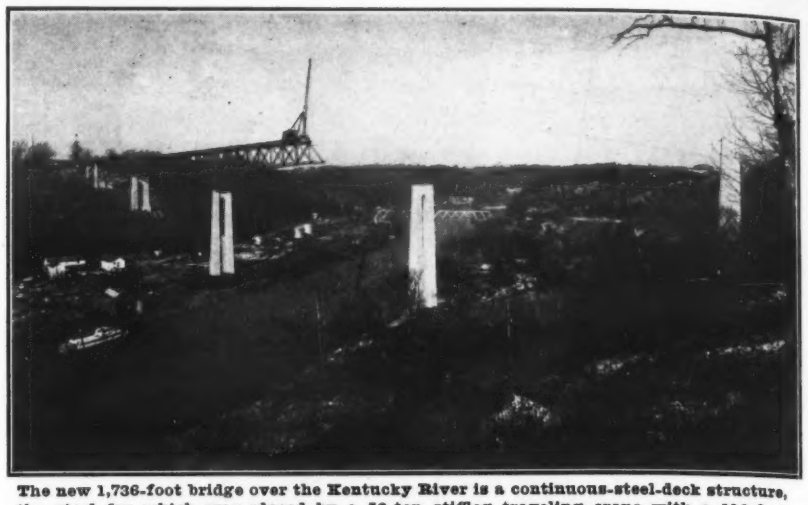
The major items in the substructure contract included:

Excavation	7,271 cu. yds.
Concrete, Class A	10,511 cu. yds.
Steel reinforcement	730,562 lbs.

Steel Erection

The fabrication and erection of the steel superstructure were done by the Mount Vernon Bridge Co. of Mt. Vernon, Ohio, for a contract price of $504,-134.71. After fabrication at the Mount Vernon shop, the steel was shipped 240 miles by freight to Lexington. There the pieces were unloaded by a truck equipped with an A-frame and winch having a 15-ton capacity. Truck trailers of the Lexington Trucking Co. hauled the steel to the north bank of the river where the contractor had set up a 50-ton stiffleg derrick with a 90-foot boom to unload and handle the steel members.

Starting as the north end, the steel was erected by means of a 50-ton stiff-leg traveling crane with a Mundy hoist and a 110-foot boom, riding on the



The new 1,736-foot bridge over the Kentucky River is a continuous-steel-deck structure, the steel for which was placed by a 50-ton stiffleg traveling crane with a 110-foot boom and a Mundy hoist. Here the crane is at the center of the main span.

stringers laid on top of the trusses as they were built out in cantilever fashion. The steel was hauled out on cars pushed by a gasoline locomotive running on tracks beside the traveler. Across the first two 50-foot spans, which had not yet been constructed with concrete girders, temporary steel was placed for the traveler and supply cars to advance.

The 192-foot simple-truss span was erected on falsework bents of H-beams placed under the second and fourth panel points and stiffened with knee braces. These sets of H-beams, 40 feet 6 inches and 61 feet 2 inches long respectively, were afterwards used as truss members in the remaining steel construction.

On the next 320-foot truss the traveler placed 192 feet of span to the sixth panel point by cantilevering, during which operation the traveler advanced as far as the third panel point. This cantilevering was made possible by strengthening the top and bottom chords of the previous simple-truss span with heavier extra members, and extending the side plates, thereby converting the simple span into a cantilever. When the steel work was completed, these added members were cut at a point over the pier, changing the 192-foot span into a simple truss again.

To complete the remaining 128 feet of the 320-foot span, a steel erection pier was built up from the ground under the sixth panel point. This pier consisted of two 33-inch wide-flange 152-pound beams, driven 68 feet 4½ inches apart on centers into the ground, and tapering in to the 22½-foot spacing of the trusses at the top. This supporting falsework was 173 feet 10¾ inches high; it was made up of two 68-foot lengths for the first two sections from the ground and a length 37 feet 10¾ inches for the top section. The beam sections were bolted together and supported by guys anchored in the ground.

The traveler then continued, setting steel for 320 feet of the 448-foot main span in a cantilever operation, before the temporary bent had to be re-erected at a point 128 feet from the next pier. This time the tall support had to be set up in the river. A foundation of two cages, 68 feet 4½ inches on centers, was driven to support the framework. The steel cages were assembled on a derrick boat equipped with a McKiernan-Terry steam hammer for driving the beam piles. Each cage consisted of four 12-inch H-beams laid out in a 16 x 12-foot rectangle and driven through 4 to 5 feet of silt to the rocky bed of the river.

With the falsework pier in this new position, the traveler completed the steel of the main span and three panels of the adjoining span. At this point no further vertical support was required, so the falsework was dismantled and the steel members used in the rest of the bridge. Sufficient continuous weight of steel was now behind the traveler so that the remaining 224 feet of the 320-foot side span, and the final 192-foot simple span were erected by cantilevering forward without vertical falsework support. Top chord connectors supplied the necessary added strength.

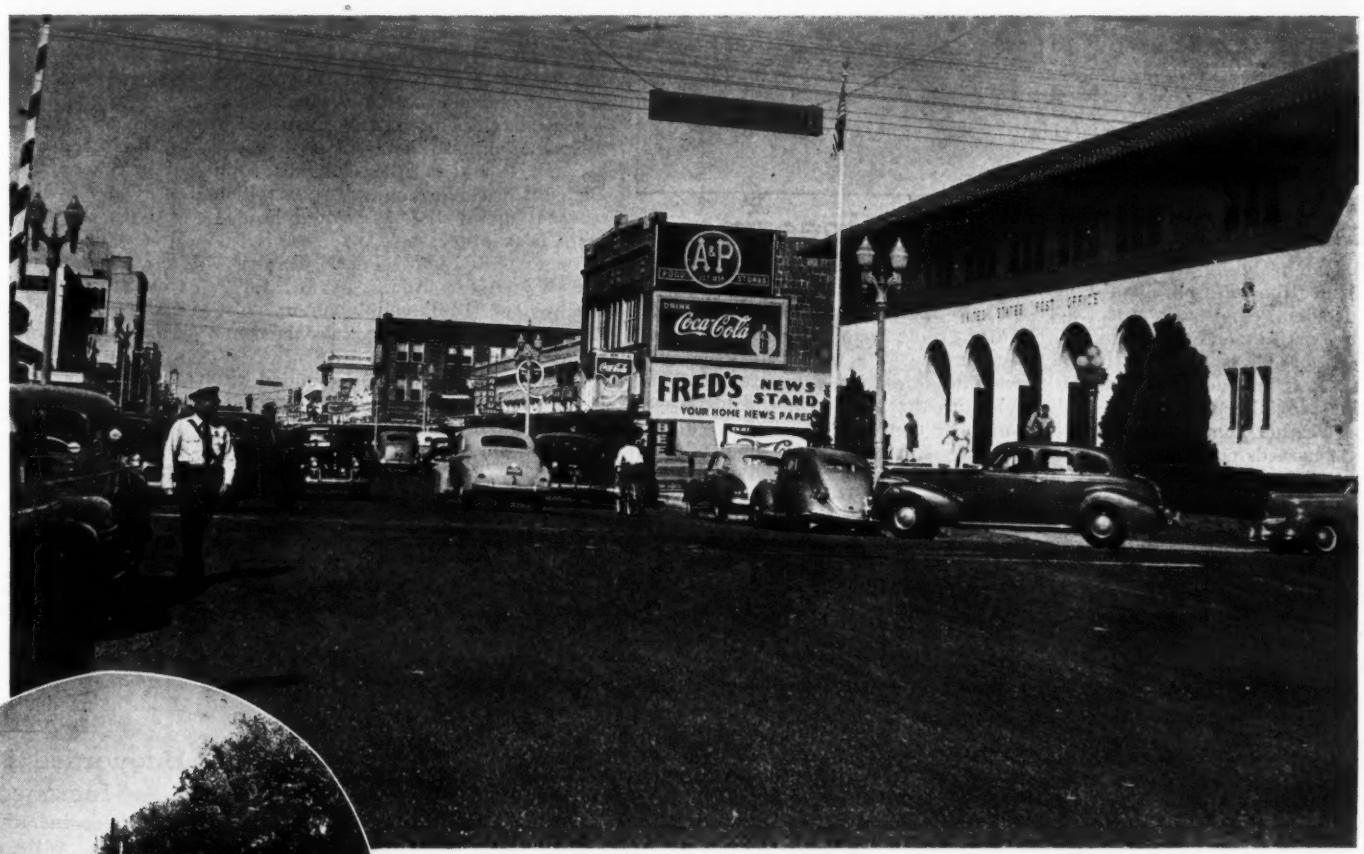
Riveting

The steel members in the superstructure were connected by ⅞-inch bolts and 15/16-inch pins in about equal proportions. Erection of the steel was started in September, 1944, and was completed in April, 1945, but the driv-

(*Continued on page* 15)

Started before Pearl Harbor and delayed because of wartime shortages of materials and men, the new high bridge carrying U. S. 25 over the Kentucky River 16 miles south of Lexington, Ky., will be opened this summer. At left, below, the traveler nears completion of the 448-foot main span, 320 feet of which was set by cantilevering; then the steel falsework pier was erected. At right, a view of the structure from the Lexington end.

How to give an old street a smooth, skidproof surface, using low-cost Texaco construction



A new Texaco Asphalt surface of the low-cost type, laid over the old pavement on main thoroughfare of Clearwater, Fla., by L. J. and W. L. Cobb.

Applying seal coat of Texaco Cutback Asphalt to street in Clearwater.

Using broom drag to mix Texaco seal coat with previously spread stone chips.

If you are faced by the problem of what to do about worn, rough streets, Clearwater, Fla., offers a solution which is economical as well as effective.

Clearwater's principal thoroughfare had an old asphalt block pavement. A new low-cost Texaco surface, such as was constructed by this community, should prove equally satisfactory for salvaging all types of pavement.

Texaco Rapid-curing Cutback Asphalt and crushed stone were plant-mixed and laid over the old pavement at the rate of 110 pounds per square yard. This was followed by stone chips and a light application of Cutback Asphalt, which were mixed by a broom drag and rolled.

The result is a resilient, durable pavement, well suited to the traffic conditions reflected by the large photograph.

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TEXACO ASPHALT

Contractors and Engineers Monthly

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Safety and Highway Engineering

Modern road design and construction will not insure the total elimination of highway accidents—not as long as imperfections exist in men and motorcars. Carelessness, recklessness, errors of judgement, fatigue, and other human shortcomings, together with mechanical failures or weather conditions, will always create hazards conducive to traffic accidents. Sound engineering will, however, contribute mightily to a lowering in the number of these accidents. It can at least make highways as safe and as foolproof as the human equation will permit.

This phase of highway safety, as well as many others, was discussed last month at the President's Highway Safety Conference in Washington. There over 1,000 delegates assembled for probably the most intense study of the highway-safety problem ever undertaken in this country. The awesome statistics it revealed—that for the first quarter of this year 8,120 men, women, and children were killed in highway traffic accidents—were a grim reminder that safety is a national problem and has to be approached as such. The members of the Conference were a hand-picked group including top-ranking Federal officials, police and motor-vehicle department heads, and representatives of labor and industry. All were cognizant of the need for immediate action to reduce this death toll on the highways.

At their three-day session eight major committees approached the problem from different angles: education, law enforcement, engineering, motor-vehicle administration, accident records, organized public support, and public information. They submitted reports on their findings, with recommendations for courses of action. Some of these recommendations can be acted upon at once; others, necessarily, are for the long pull.

Highway-engineering falls into both categories, immediate and long-term. Definite improvements can be incorporated right now in the great $3,000,000,000 highway-improvement program which the states, in cooperation with the Federal government, are undertaking. Roads can be built wider with dividing strips to separate traffic moving in opposite directions. Sharp curves and steep grades can be lessened to provide greater sight distances. Smoother and more lasting surfaces can be obtained with greater attention to the roadbed and to the materials and equipment of construction.

Highway engineering will also be responsible for benefits in the long-range future—when it reconstructs old and dangerous roads on new alignment and with flatter vertical curves, or when it builds new highways incorporating all the latest features of the road builders' art and skill.

This concerted safety program demands cooperation from everyone who uses the highways if it is to reduce the toll of accidents in 1946. If the present accelerating rate is not lessened, the year's total may exceed that of 1941, the most disastrous year in the history of American motoring—40,000 were killed! Highway engineers must—and will—do their share in making and keeping our highways safe.

F-A Highway Contracts Hit High of 392 in April

A substantial increase in the number of contracts awarded by state highway departments during April for work on Federal-Aid projects has been reported by the Public Roads Administration. During that month, state highway departments let 393 contracts for work to cost $55,932,506. This is only slightly less than the total of 413 awards made during the first three months of the year, at a cost of $71,803,075.

A total of 805 contracts were let from January through April. These have a total value of $127,735,581. Seventy-eight other contracts were pending at the end of April. They cover work to cost $14,729,085.

From January to May the state highway departments rejected 201 bids on Federal-Aid road work. The main cause for rejection was variance between the low bid and estimated cost. PRA failed to concur in 36 state-approved bids for similar reasons.

In the first four months of the year, 2,299 contracts were awarded for all types of road work carried on under Federal or state supervision. These will improve 10,217 miles at a cost of $173,037,391.

Permanent Spot Sales Of Surplus Expected

Surplus construction machinery will continue to be disposed of through "spot" sales rather than "site" sales, competent Washington observers believe. This view is based on studies of the activities of the various surplus-disposal agencies that have been organized to date, including the present War Assets Administration.

Some time ago, the Committee on Disposal of Government Surplus which was set up by the Associated Equipment Distributors held a series of conferences with Lieut. Gen. E. B. Gregory, War Assets Administrator. Ed P. Phillips of Phillips Machinery Co., Richmond, Va., is Chairman of the committee.

Conference discussion included the various viewpoints and philosophies governing distribution of heavy-construction and road-building machinery. It also stressed problems relating to disposal of the hundreds of millions of dollars' worth of equipment in this classification which still remains to be sold.

Committee members emphasized to WAA officials that spot sales of such machinery afford more equitable and widespread distribution of the surplus than do site sales. Spot sales are conducted on a monthly cycle of operations, while site sales are limited largely to local distribution and hinder participation of many buyers in other parts of the country.

During the conferences, spokesmen for the WAA indicated that the present policy was to exclude construction machinery from site sales. In view of this indication from WAA, and since the majority of the nation's dealers have approved the spot-sale method, officials of the AED feel that this system will continue until all surplus construction equipment has been completely disposed of.

LET'S ELIMINATE THIS SHADOW

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Structural-Steel Price Controls Are Suspended

The recently announced suspension of price controls on fabricated structural steel will stimulate construction activity throughout the country, says Robert T. Brooks, Executive Vice President of the American Institute of Steel Construction.

Considerable benefits will accrue from the removal of controls on steel sales, he claimed. Fabricators will be able to accept many pending orders and to plan for new business, both difficult to do under the past strict price regulation. No drastic effect on prices is expected.

The steel-fabricating plants have adequate capacity to meet the demand for structural steel, as well as any foreseeable future needs, the Institute's executive head reported. The industry is cooperating fully with the Government's housing program, and the decision by OPA authorities will permit it to go ahead on a greatly expanded program of needed construction.

Unguarded Blasting Caps Increase Child Injuries

A sharp increase in serious injuries to children as the result of playing with "found" dynamite blasting caps has been reported by the Institute of Makers of Explosives. The upswing in 1945 was serious, though the trend in recent months has shown improvement.

Warnings against blasting caps are being distributed by the Institute through the nation's school systems. Colored posters and leaflets appealing for widespread cooperation during the summer-vacation months are being circulated on a nationwide basis.

Blasting caps seem to have a special lure for children, an Institute official says. He blames carelessness on the part of construction officials and workers for the presence of such caps in places where children can find them.

Are your workers properly instructed in the handling of blasting caps.

Seabee Officers Needed

Former Seabee warrant officers, as well as other qualified men and officers with a background of construction work, are being sought to fill approximately 50 vacancies in the regular U. S. Navy warrant officer grades.

Needed particularly for work at overseas naval bases and other projects administered by the Bureau of Yards and Docks, the warrant officers, including chief warrant officers, would be assigned to varied duties involving all types of naval shore maintenance and construction.

Former warrant and commissioned officers are eligible if they had not passed their thirty-seventh birthday on the date of their first appointment above chief petty officer. Other eligibility requirements are set forth in Bureau of Naval Personnel Circular Letter 288-45 (revised).

Further information may be secured at U. S. Navy recruiting offices.

Mixing ASPHALT ASPHALT EMULSION POWDER OR TAR ?

New! Jam-packed with facts. Just off the press — "Soil Stabilization Methods" — a newly compiled edition of the popular book. Ask for Bulletin E-26

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★ **UNIFORMITY** Whether the aggregate be low grade, pit-run or of ideal gradation — the Seaman Mixer produces a thorough, intimate and uniform mix more quickly. Variance in aggregate with consequent variance in voids are more readily corrected with the Seaman — and variances in mat thickness are negligible, for accurate control of mixing depth is an outstanding Seaman characteristic.

★ **GREATER OUTPUT** Under average conditions it is not unusual for the Seaman to handle 1500 to 1800 cubic yards per day in windrow mixing. When the aggregate is spread flat, and the Seaman used as the only mixing equipment, 3000 feet of pavement 22 feet wide and 7 inches in depth, is very common. In shallow treatments, 2000 square yards *per hour* have been obtained.

SEAMAN MOTORS

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C-120

So for your next asphalt job–do your road-mixing with the Seaman

Pavement Resurfaced With Hot Plant-Mix

State Forces Operate Own Crusher, Asphalt Plant; Pre-Mixed Base Laid for Strip Widening on Sides

✦ THE improvement of a 7½-mile stretch of road on U. S. 4, which cuts across the center of the Green Mountain State from New Hampshire to New York, will be completed this summer by the Vermont Department of Highways. The reconstruction begins at White River Junction on the Connecticut River at the eastern border of the state, and continues west to Quechee. In 1934 an 18-foot concrete pavement with a 7-inch slab depth was laid through this typical hilly Vermont terrain, following the alignment, as much as possible, of the abandoned Quechee Railroad. During subsequent winters, the use of chemicals on these grades resulted in a badly scaled pavement which required rehabilitation of the highway surface in some form or another.

Bituminous roads in Vermont are usually of macadam construction, road-mix, or surface treatments on gravel base courses, with very little machine-laid plant-mix. However, aware of the great increase throughout the country in the use of plant-mix bituminous concrete for resurfacing old cement-concrete roads, Vermont Highway Department engineers decided to experiment with this type of surface, keeping in mind its possible further use if the results are satisfactory. Accordingly state maintenance forces were assigned the job, first of widening this piece of road from 18 to 20 feet, and then of laying a 2-course hot-plant-mix surface. In Vermont the bulk of road construction is done by contract; an exception was made of this experimental job on U. S. 4 so that the Department of Highways could study it carefully, and write specifications to govern future work of this nature to be performed by contractors.

Grading and Widening

As this reconstruction is financed in part by Federal-Aid money, 2,000 feet of 8-foot shoulder had to be built on one side in every mile of road; this is a Government specification, written with an eye to possible future use of the road by military convoys which would need adequate turnouts for parking. The remaining shoulder width averages 4 to 6 feet, an increase of from 1 to 2 feet over the original width. Grading operations, including 18,000 cubic yards of excavation, were started last June with a Bucyrus-Erie ⅜-yard shovel. The excavated material was hauled to the fill sections, dumped, and pushed over the sides by rented Caterpillar and Cletrac tractors equipped with Angledozers, until the necessary shoulder width was attained.

Along with the grading, widening operations were carried on. A 4-foot-wide trench was dug on each side of the concrete pavement and filled with gravel. The trench was excavated to an average depth of 1 foot below the top of the concrete by ⅜-yard shovels in cut sections and Angledozers in fill sections. An excellent grade of pit-run gravel for backfilling the trench was obtained from two pits along the right-of-way within 2½ miles of the center of the job. Two shovels, a Lorain ½-yard and a ⅜-yard, worked the pit, while sixteen trucks of assorted makes and sizes hauled the gravel, as well as dirt from the road excavation. The gravel was dumped in the trench and spread by power graders in two layers of about 6 inches each, compaction being achieved with the wheels of the trucks. When necessary, the gravel was kept wet during the filling operation with water flowing by gravity through a hose connected to a 500-gallon tank carried on a truck. These tanks were filled either from the Quechee River at the west end of the project, or from streams at the east end by means of a Gorman-Rupp 3-inch pump driven by a Wisconsin gas engine.

The engineers decided on a stronger and more stabilized foundation than the compacted gravel for use under the new bituminous concrete where it was extended on each side beyond the existing pavement. Accordingly a 3-inch-deep cut, 18 inches wide, was taken in the freshly filled gravel. The Galion power grader used for this operation had a special drop blade bolted below the regular 10-foot blade at the outside edge. This attachment was 3 inches deep and 26 inches wide, but the grader blade was set at such an angle that only an 18-inch-wide cut was taken. Beyond the edge of the regular blade a 2-foot arm was fastened; its function was to knock down and flatten out over the shoulder the windrow formed from the excavated material.

C. & E. M. Photo

For its first bituminous-concrete resurfacing project, the Vermont Department of Highways set up a gravel crushing plant on the bank of the Ompompanoosuc River. Equipped with a Cedarapids 9 x 36 jaw crusher and a Cedarapids 3 x 36-inch secondary crusher, the plant provided two sizes of aggregate for the hot-mix, ⅜ to ¾-inch gravel, and fines under ¾-inch.

The cut-out section was then filled with gravel. This had been mixed with RC-2 asphalt, at the rate of 14 gallons to the cubic yard, in a state-owned Barber-Greene mixing plant, which was later used in the preparation of the surface hot-mix. The shallow trench was filled from a spreader box attached to the rear end of a truck, and tilted so that the material flowed out readily as the truck moved slowly along. A light roller followed to compact the base course. This stabilized base is 18 inches wide although the pavement widening is only 1 foot on each side; the additional 6 inches will tend to prevent raveling at the edge of the surface course.

Paving Procedure

In preparation for the resurfacing, all old bituminous patches on the concrete were scraped off by an Austin-Western power grader, and the expansion joints were opened to a 1½-inch depth. A special tool was used for cutting out the joints; it consisted of a metal plow placed between two flat steel strips riding on the pavement, and was equipped with plow handles for guiding. The device was pulled by a Farmall rubber-tired tractor.

The serious labor shortage in 1945 held up the work preliminary to the paving. So surfacing operations did not get under way until the middle of September. Winter closed in before the entire 7½-mile stretch was completed, but the rest of the resurfacing will be finished this summer. This hot-mix job, the first to be done in Vermont exclusively by state forces, is laid in two courses, a 1½-inch compacted base and a 1-inch compacted top, in two 10-foot lanes.

The material is mixed at a state-owned asphalt plant located near Union Village, about 15 miles north of White River Junction; from there it is hauled in trucks hired on an hourly basis. Despite the truck shortage last autumn, an average of twelve units, carrying 3 to 5 yards to a load, were kept busy on the 19-mile average haul; a round trip took about 1¾ hours. These trucks, mostly Fords, Chevrolets, Dodges, or Whites, were recruited from all over the state. They were outfitted with tarpaulins to keep the mix warm in transit so that it was spread at a temperature ranging between 280 and 335 degrees F.

A Barber-Greene Tamping-Leveling Finisher spread the material, averaging about 1,200 to 1,600 feet of full-width base course or 1,800 feet of full-width top course in the normal 9-hour working day. Base course was laid in two 10-foot lanes over about half the project, and then covered with the top course in the same fashion before work on the base and top for the final half was started. In spreading both bottom and top courses the work was so arranged that a full-width section was completed each day, to avoid leaving the center joint exposed. On banked curves the low side was paved first, as experience has proved that a better joint is thus effected. A Buffalo-Springfield 12-ton 3-wheel roller worked from 100 to 200 feet behind the finisher except when a new section was being started, and in such cases the joint was rolled almost immediately after the material was spread. The rolling was usually from the edge of the road to the center.

After a new section was started and the first few feet had been spread, one of the crew sifted a thin layer of hot-mix over the surface through a 1 x 2-foot box covered with a ⅜-inch screen. This screen removed the larger stone, leaving on the pavement a thin film of fine material which was then rolled to make a tightly knit surface at the new joint. This fine-screened material was also sifted over any open spots that showed up in the surface pattern.

The work already done on the road was carried on by a crew of 10 men consisting of the finisher operator, a man on the adjusting screws, 5 laborers for raking and shoveling, 2 flagmen, and the roller operator. The hand tools were kept clean by frequent immersions in a pail of kerosene carried along with the finisher. The metal bodies of the trucks were sprayed with light oil at the plant before each load to prevent the hot-mix from sticking. Traffic was permitted on the road shortly after the

(Continued on next page)

C. & E. M. Photo

About 100 feet from the crushing plant, a Barber-Greene asphalt plant was set up, and has turned out 40 tons of hot-mix an hour. The aggregate is picked up from a stockpile and delivered to the plant 15-yard hopper by the Lorain 30 crane and clamshell seen in the foreground.

Pavement Resurfaced With Hot Plant-Mix

(*Continued from preceding page*)

fresh pavement had been rolled.

Gravel-Crushing Plant

In a clearing along the right bank of the Ompompanoosuc River, the Department of Highways set up next to each other a gravel crusher and an asphalt plant. This isolated location is reached over a narrow winding road leaving U. S. 5 north of White River Junction and continuing northwest to Union Village and the plant site, 19 miles from the center of the job. Half a mile up Copper Mine Road beyond the crusher is the privately owned Darling pit where a Bucyrus-Erie ¾-yard shovel takes gravel from a 75-foot face and loads it into two Ford trucks which haul the material to the crusher, 3 yards to the load.

Here the gravel is dumped into a 6-yard hopper at the bottom of which is a New England reciprocating feeder to move the material along to a rising conveyor belt, 30 feet long x 2 feet wide, which carries it up to a grizzly screen. The grizzly segregates anything over 1¼ inches, dropping it into a Cedarapids 9 x 36-inch jaw crusher. A Fairbanks-Morse 60-hp diesel engine drives the crusher which is linked up with the conveyor belt, and which in turn motivates the hopper feeder. The crushed gravel, together with the fines separated by the grizzly, then ascends a 60-foot-long x 2-foot-wide conveyor belt set at right angles to the first belt. At the top the gravel enters a rotary screen, 18 feet long x 4 feet in diameter, with the initial 8 feet having ¾-inch openings, and the next 4 feet having ⅝-inch openings; the remaining length of the rotary is not used in this processing. Surrounding the first 4 feet of screen is a larger section of screen, 6 feet in diameter, with a ⅜-inch mesh to collect the fines.

Tailings from the rotary drop to a Cedarapids 3 x 36-inch secondary crusher. From there they are sent back to the screen by a nearly vertical 30-foot bucket conveyor. A Waukesha 85-hp gas engine drives the secondary crusher, which is equipped with a countershaft hooked up to the rotary screen; the long conveyor and the bucket elevator are also powered from this unit. Beneath the screen are two bins of 21-yard capacity each, the first holding gravel ranging in size from ⅜ to ¾ inch, and the other holding the equivalent of sand, or all fines under ⅜ inch in size. A continual overproduction of fines has necessitated the return of much of this surplus to the pit to be wasted.

Asphalt Plant

A single Ford truck carrying 3 yards to the load hauls the material from the bins less than 100 feet to a stockpile alongside the Barber-Greene asphalt plant. The material is picked up by a Lorain 30 crane with a 30-foot boom and a Mead-Morrison ½-yard clamshell bucket and delivered to the plant 15-yard hopper. From the hopper the aggregate moves up a 20-foot bucket elevator to a drier, 18 feet long x 4 feet in diameter, which is heated by a single Hauck torch burning 500 gallons of fuel oil in a 9-hour day. A Le Roi 31-hp gas engine powers the cold elevator, the drier, and a 30-foot enclosed hot elevator which takes the heated gravel and fines to a Simplex 3 x 5-foot triple-deck vibrating screen.

The upper screen is either 9/16 or ¾-inch size, depending on whether top or base-course material is being mixed; the two lower screens are 5/16-inch and No. 8 size respectively. Powered by a Wisconsin 18-hp gas engine, the screens shake the aggregate down into three bins below, the first holding 8 yards of sand, that is fine material between the No. 8 and No. 200 sieves; the second holding 10 yards of intermediate stone between No. 8 and 5/16-inch size; and the last bin holding 6 yards of coarse stone from 5/16 up to 9/16 or ¾-inch, according to the course being paved.

From the bins, the fine and coarse aggregate passes in a constant stream towards the pugmill, measured as it goes by reciprocating feeder gates. One yard of material is mixed for about 2½ minutes with 85 to 100-penetration asphalt flowing from a 500-gallon storage tank in the plant at the rate of 11.64 gallons per minute. A Buda 50-hp engine drives the mixer. The plant has turned out about 40 tons of hot-mix per hour.

No asphalt was stored on the job last autumn, as whatever was trucked in was used immediately. The asphalt came to White River Junction in tank cars over the B & M and Central Vermont railroads from the Socony-Vacuum Oil Co. plant at Providence, R. I. The asphalt was heated at the Central Vermont Railroad roundhouse, pumped from the cars, and hauled 15 miles to the plant by Gorman Bros.

(*Concluded on next page*)

C. & E. M. Photo

A Barber-Greene Tamping-Leveling Finisher lays hot-mix top course, at an average rate of 1,800 feet of full-width pavement per 9-hour day, on a 7½-mile resurfacing project on U. S. 4 in Vermont.

Contractors: Order the equipment you need NOW!
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Pavement Resurfaced With Hot Plant-Mix

(*Continued from preceding page*)

Inc., of Troy, N. Y. Two Etnyre distributors, of 1,100 and 1,000-gallon capacity, on Mack trucks were used to transport the asphalt. It was heated on the way to a temperature of 360 degrees F before being pumped directly to the pugmill by the distributor pumps. Thus no asphalt storage tanks were needed at the plant, and the only function of the locomotive-type, vertical, coal-burning, 35-hp boiler was to furnish steam for vaporizing the fuel oil burned in the drier. The fuel oil is stored in an 8,000-gallon tank. Fortunately the plant is located in the open country, so the absence of a dust collector is not noticed as much as it would be if a village or town were within range of the heavy "soot" that is blown about the surrounding area.

Mineral filler, a domestic ground limestone supplied in paper sacks from the Vermont Marble Co. at Proctor, Vt., is added to the mix by hand through a hopper located directly above the pugmill. Its flow is also feeder-regulated. The gradation of the filler is as follows:

Sieve Size	Per Cent Passing (by Weight)
No. 20	100
No. 40	99.5
No. 80	96.5
No. 200	86.0

The gradation of the two courses of mix, filler included, for a typical batch is as follows:

Sieve Size (Square Opening)		Per Cent by Weight	
Passing	Retained	Base	Top
¾-inch	½-inch	33	0
½-inch	⅜-inch	12	13
⅜-inch	No. 4	8	22
No. 4	No. 10	7	15
No. 10	No. 40	16	22
No. 40	No. 80	9	12
No. 80	No. 200	5	5
No. 200	.....	4	5
Asphalt (penetration 85-100)		6	6

The hot-mix is discharged into the trucks at the side of the plant through a movable feeder box which the foreman, standing on a wooden platform on the other side of the truck, swings back and forth so that the truck body is uniformly loaded. In addition to this foreman, a crew of eight was used to operate the plant and crusher.

Items and Personnel

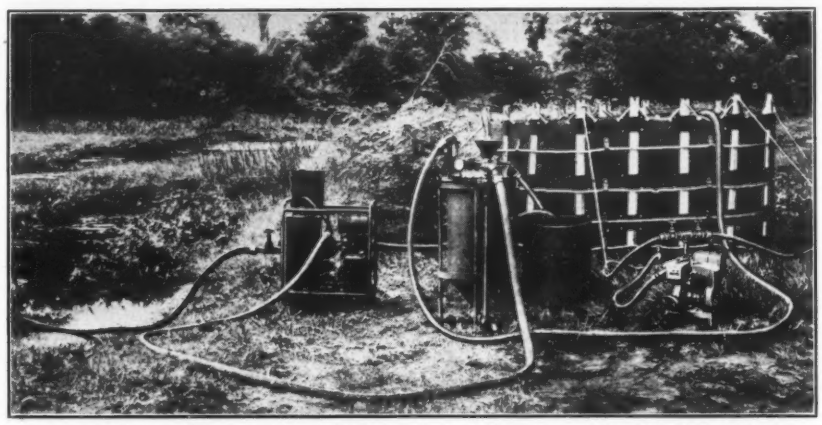
The principal items required for this highway-improvement project include:

Excavation	18,000 cu. yds.
Gravel	16,000 cu. yds.
Pre-mixed gravel (shoulder foundation)	750 cu. yds.
Plant-mix	6,000 cu. yds.

Heading the Vermont Department of Highways which is performing this work is Hubert E. Sargent, Commissioner and Chief Engineer, while F. C. Coates is Construction Engineer. E. O. Webster is Resident Engineer on the road operations, and Ralph Harvey is Foreman at the plants. The Department reports that the new pavement came through its first winter without a blemish and provides an excellent smooth-riding surface.

Portable Filter Gives Pure Water on the Job

Purified drinking water for construction crews and others working in out-of-the-way regions is made possible by the Pur-O-Pumper, a portable water-treatment and filtration unit manufactured by Proportioneers, Inc. The purifier is carried to the job on a light truck. When set up, it pumps ordinary river or pond water through filtration units into a storage tank. Depending on the turbidity of the source water, 4,000 to 16,000 gallons of pure water can be made available daily. The filtration is mechanical, obviating the need for an operator trained in filtration chemistry.



Pure drinking water on construction jobs is important to workers' health and sustained high production. The Pur-O-Pumper is an easily portable unit which chlorinates and filters river or pond water to purify it for drinking purposes.

River water is treated by a chlorine solution and forced through a diatomaceous earth-type filter capable of removing not only organic and inorganic suspended solids but also the elusive amoebic cyst and bacteria, Proportioneers says. The diatomaceous filters are smaller than conventional sand filters of equal capacity because of their ability to operate at a high rate with almost complete utilization of the filter area.

Full details on this portable water purifier can be obtained by writing Proportioneers, Inc., 99 Codding St., Providence 1, R. I. Just mention this illustrated item.

Torque Converter Tractor

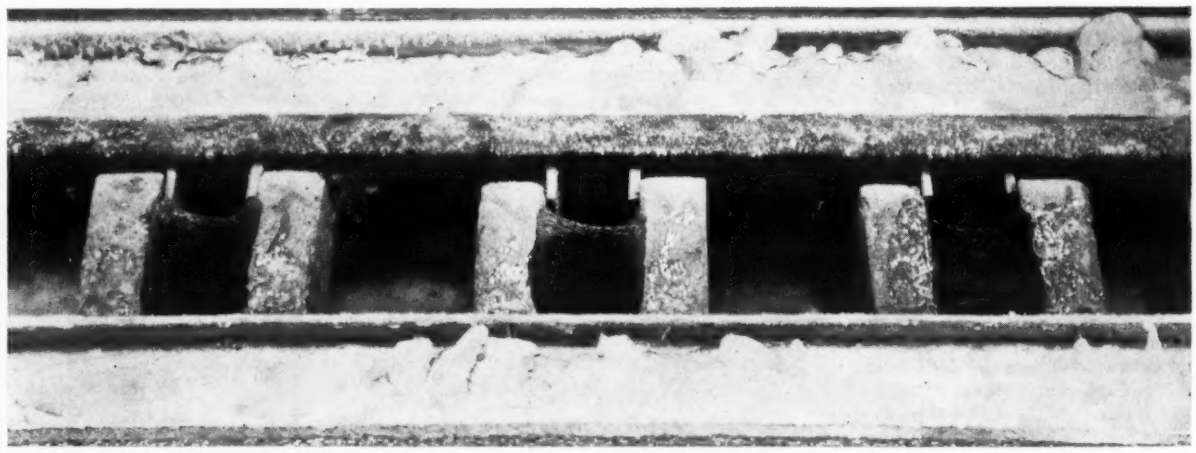
Smoother tractor operation is provided by the Torque Converter, a feature of the HD-14-C tractor, the Allis-Chalmers Tractor Division says. Developed in Europe, this feature has been adapted to tractors by Allis-Chalmers to provide long working life, operational ease, as well as accurate control and simple transmission. The Torque-Converter principle eliminates a jerking effect that causes wear on the tractor, on allied equipment, and on the driver.

This principle, and its application in the Allis-Chalmers HD-14-C, is described and diagrammed in a 12-page booklet available on request to readers of CONTRACTORS AND ENGINEERS MONTHLY. Write the Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Chicago's New — Filtration Plant
79th Street and the Lake Front
Supplying PURE WATER to the South Side
USED Servicised:
Para-Plastic
JOINT SEALING COMPOUND.
PARA-PLASTIC: is Waterproof, Extendable and Maintains Bond — through all Temperature Variations down to Subzero Weather

The massive concrete chambers of the South Side Filtration Plant in Chicago pictured above are free to move (as all concrete structures must with temperature change and settling) without danger of leakage or foreign matter getting into the purified water. To a large extent this is made possible by the use of Servicised Para-Plastic compound to seal the joints in the structure, so that regardless of movement they stay sealed. In addition, Servicised furnished the premolded, resilient, non-extruding joint filler which was made to meet Federal Specifications HH-F-341. In general, we recommend for use on all concrete construction required in connection with either water works or sewage treatment, Servicised Cork or Self-Expanding Cork Joint Filler combined with Servicised Para-Plastic Joint Sealing Compound for a perfect job.

Para-Plastic is scientifically made to meet all needs for waterproofing concrete joints and is given numerous tests in our laboratory prior to shipment. One of these tests is pictured below.



The above view showing the "Bond Test" gives only a small interior section of a large specially constructed Freezing Unit with powered "separators" where hundreds of small samples of Para-Plastic are tested for Bonding Power and Extendability at O'F.

Para-Plastic is applicable for a great variety of uses: besides being a hot pouring compound it is also made into a number of premolded forms. The wide classification of Expansion Joints makes it important that the right joint material and form be selected in each instance. There is not a better guarantee of safety for your investment than this assurance. SERVICISED Laboratories and Engineering Departments are ready at all times to assist with your joint sealing problems and to offer recommendations gratis on the basis of experience gained in this field during the past 25 years.

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SERVICISED PRODUCTS CORP.
6051 West 65th Street, Chicago 38, Ill.

Flame Guns Are Helpful In the Care of Roadsides

Highway-department personnel whose duties include roadside maintenance and the care of picnic areas and similar reservations will be interested in a new catalog just issued by the Hauck Mfg. Co. The 24-page booklet describes the Hauck flame guns and their use in destroying weeds and other undesirable growth. The devices also burn garbage, split rocks and boulders, char fence posts, and perform many flame-cleansing duties.

Hauck makes nine different models of flame guns, in sizes from the 16-pound hand Hercules to the 205-pound wheel-mounted Double Hercules, and larger. All guns have burners capable of producing a 2,000-degree-F flat flame. Skid-mounted models are available in addition to the hand-carry and wheeled units.

The many and varied uses of the Hauck flame guns are illustrated in Catalog 2028. Readers of CONTRACTORS AND ENGINEERS MONTHLY can obtain copies by writing the firm at 124 Tenth St., Brooklyn 15, N. Y. Mention this news report.

Consolidated Diesel Moves

The Consolidated Diesel Electric Corp., manufacturer of diesel and gasoline-driven electric plants, has moved to a new and larger plant at 230 E. 8th St., Mount Vernon, N. Y.

Meeker Heads J. D. Adams

Executive Vice President Howard R. Meeker of the J. D. Adams Mfg. Co., Indianapolis, has been elected President of the firm. He has been a member of the Adams organization since 1913, holding various posts before becoming Executive Vice President in 1939. Roy E. Adams has been serving as President as well as Chairman of the Board of Directors. Mr. Adams retains the office of Chairman of the Board.

It's New...

Not a warmed over wartime model

★ The TL-20 never wore the olive drab of the Armed Forces. Nor is it a prewar baby that languished on the shelf until now. From drafting board to finished product, every effort has been made to make the TL-20 a truly new "postwar" unit in the ½ yd. class.

Check the partial list of TL-20 features shown here. They will give you a good tip-off on both the profit and performance possibilities of this unit. Then, to get the complete story on why the TL-20 carries the label "New"—and can make it stick—ask your Thew-Lorain distributor for a copy of the TL-20 bulletin.

DESIGN FEATURES:

Unit Assembly—*Each major component — clutch shaft, engine, hoist shaft, cab, crawler propelling mechanism — can be removed and interchanged as a complete unit.*

5 Identical Clutches—*All operations controlled by 5 shoe clutches, mounted on clutch shaft, which are interchangeable in all working parts.*

Oil-Enclosed Cut Gears—*All gears, on turntable and mountings, are machine cut; all gears (except two) are fully enclosed and run in lubricant.*

One-Piece Turntable Bed—*A husky one-piece, all-welded base designed to absorb strains and shocks, revolving on 4 wide-faced Hook Rollers.*

Anti-Friction Bearings—*Used on all major power shafting and friction clutch drums of turntable.*

UTILITY FEATURES:

2-Speed Crawler—*2 speeds, standard equipment, available in both directions. Features drop forged treads for greater strength and longer life.*

Rubber-Tire Mountings—*9 rubber-tired mountings (Moto-Crane or Self-Propelled types); 4 or 6 wheel units with or without front wheel drive.*

5 Interchangeable Booms—*Selection of 5 booms for shovel, crane, dragline, clamshell or hoe operation. All are readily interchangeable.*

Independent Shovel Crowd—*Positive cable crowd; all-welded shovel boom and dipper stick; electric dipper trip.*

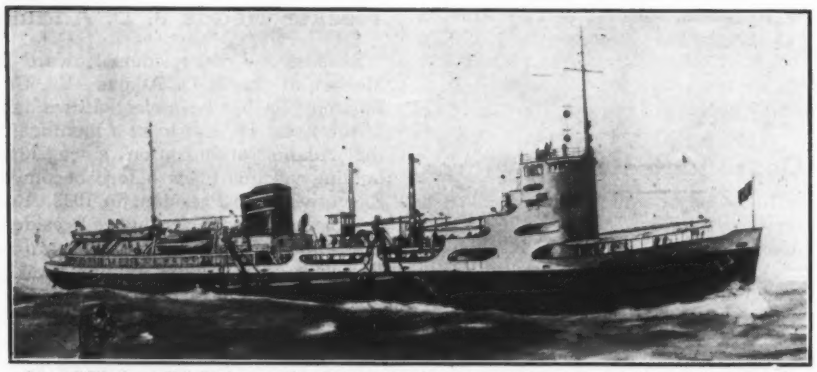
FREE... and full of facts

The complete, illustrated story on the TL-20 is contained in this bulletin. Ask your Thew-Lorain distributor for a copy or write Thew Shovel Co. direct.

Thew TL 20 Lorain

THE THEW SHOVEL CO.
LORAIN, OHIO

Available with 5 Interchangeable Booms and Choice of 10 Mountings



One of the four 352-foot seagoing hopper dredges now under construction at the Ingalls Shipbuilding Corp. yard at Pascagoula, Miss. Being built for the Army Engineers, they will play a part in the U. S. E. D.'s harbor-improvement program.

Four Hopper Dredges Being Built for U.S.E.D.

Expected to be the largest all-welded craft of their type, four 352-foot seagoing hopper dredges are being built for the Army Corps of Engineers by the Ingalls Shipbuilding Corp., Pascagoula, Miss. Powered and fitted to dredge harbors and channels anywhere on the globe, the units are to cost about $4,250,000 each.

Each ship will be capable of 13-knots speed between the dredging area and the dump site, Ingalls says. A 3,000-cubic-yard load of the heaviest dredged material can be safely transported in the vessel's large, sloped-side hoppers. Two centrifugal volute pumps—one on port and the other on starboard—will handle the dredging. Each will have a direct connected 1,150-hp motor, and a waterproof drum controller. . The latter will have at least 20 points of control, and will be installed in the dragtender's house.

Propulsion for the vessel will be by means of dc turbo-electric machinery having 6,000 shp normal full power. Two main turbo-generators will generate the power, and two electric propulsion motors will drive the propeller shafts. Steam will be generated by two water-tube, oil-fired, marine-type boilers equipped with automatic combustion control. The variable-voltage method will control the propulsion motors from zero to full speed in either direction. Control stations will be located on the bridge and in the engine room.

Four watertight bulkheads will further insure the seaworthiness and safety of the new dredges. Bulkhead doors will be operated by a hydraulic system. A single control in the pilot house will close all doors at any time, whether the hydraulic pumps are in operation or not, and each door will be provided with local controls in addition to the master control. Should an accident occur and any two watertight compartments become flooded, the dredge will not sink, even with a full load aboard, its designers claim.

Soil-Mechanics Pioneer, G-E Engineer Get Awards

Referred to by some as the "father of soil mechanics", Dr. Karl Terzaghi, world-wide consulting engineer and teacher, has been awarded the 1946 Brown Medal by the Franklin Institute, and a General Electric research man, Dr. Sanford A. Moss, Lynn, Mass., has been named to receive the Potts Medal.

The Brown Medal, given annually for an outstanding invention or discovery involving improvements in the construction field, goes to Dr. Terzaghi for his studies in the field of soil behaviour. The Potts Medal, for distinguished work in science or the arts, important development of previous basic discoveries, inventions, or products that demonstrate superior excellence or utilize important principles, is awarded Dr. Moss for making the turbosupercharger a "successful and reliable part of an internal combustion engine".

Dr. Terzaghi, a Czechoslovakian, recently became an American citizen, following years of travel about the globe as consultant for many construction projects, and as a lecturer in European and American schools. His work has covered the entire field of soil behaviour, and his studies include theories concerning the settlement of structures as well as earth pressure in timbering. It was he who established many of the experimental soil-study methods now in use and promoted the practice of combining theoretical and experimental research with accurate observations on full-sized structures. He is holder of the Fitz Gerald and Herschel Medals of the Boston Society of Civil Engineers, and the Norman Medal of the American Society of Civil Engineers. Dr. Terzaghi served as President of the International Conference on Foundations and Soil Mechanics held at Harvard in 1936.

California-born Dr. Moss came up the hard way by sheer dint of tugging on his own boot straps. He developed his now famous turbosupercharger as the First World War drew to a close, and saw it improved upon to become one of the most important factors contributing to the excellence of Allied aircraft in the war just concluded. Retiring in 1938 at 65, he returned to his duties voluntarily shortly after the Munich Pact. Holder of an LL.D. from the University of California, he was awarded the Sylvannus Albert Reed and New England Engineering Societies medals in 1944.

Aluminum Paint Protects Exposed Metal Surfaces

Highway maintenance engineers and shop superintendents will find interesting a folder on aluminum paint for metal surfaces which is available from the Reilly Tar & Chemical Corp. Used for bridges, road markers, guard rails, metal buildings, equipment, and many other applications, the Reilly aluminum coating is said to give protection against corrosion, oxidation, chemical fumes and gases, and excessive heat. It has a coal-tar base, is sprayed or brushed on, and it dries to the touch within an hour.

Copies of this descriptive folder, and others dealing with similar Reilly protective coatings, can be obtained on mention of this notice. Write to the firm at the Merchants Bank Bldg., Indianapolis 4, Ind.

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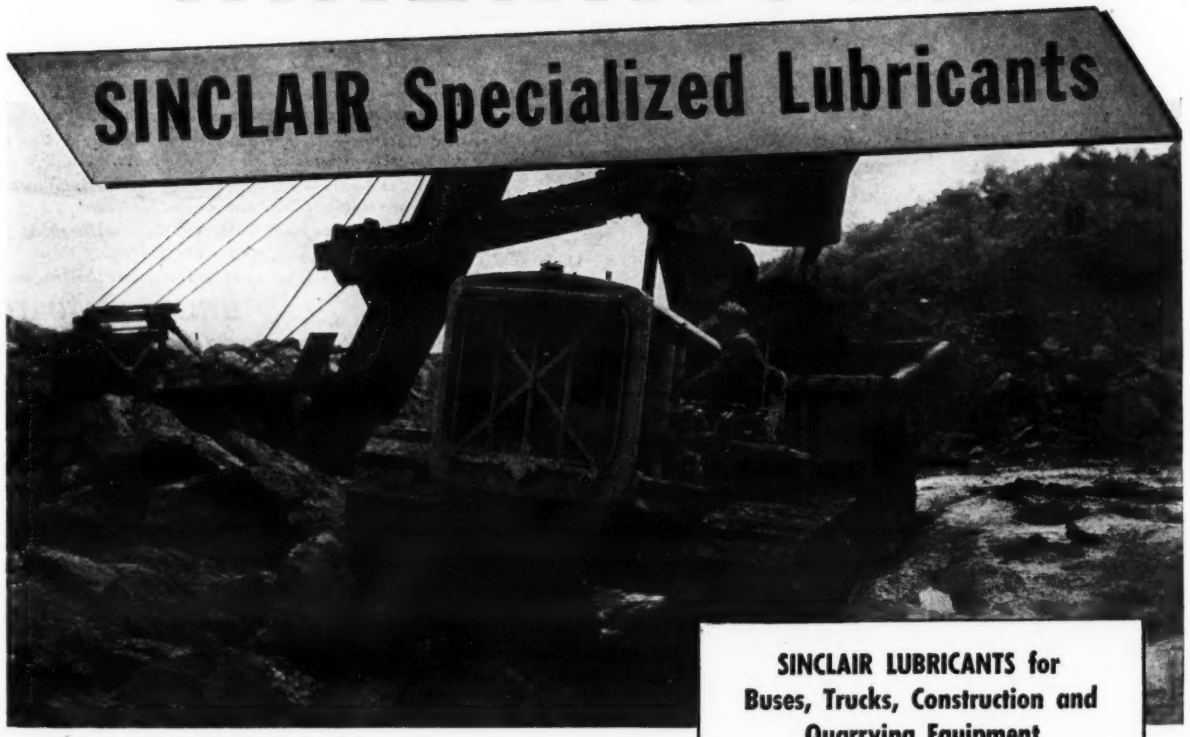


MOTOR VEHICLES — whether they be trucks, buses, power shovels or automobiles—are forever "on call." They should be ready to go . . . on a moment's notice . . . with no question about performance under any emergency.

Proper lubrication can go far toward establishing operators' peace of mind . . . and economical maintenance. Make sure vehicles and machines are primed for performance *at all times* by lubrication throughout with Sinclair automotive oils and greases.

SINCLAIR LUBRICANTS for Buses, Trucks, Construction and Quarrying Equipment

OPALINE MOTOR OIL . . . for engines . . . fortified with additives to resist oxidation, sludge, gum, and bearing corrosion.

OPALINE GEAR LUBRICANT . . . with extreme pressure properties . . . to meet all design load and speed demands.

OPALINE CHASSIS LUBRICANT . . . a tough, sturdy lubricant that protects while it lubricates . . . in spite of rain, snow and mud.

SINCOLUBE . . . made especially for wheel bearing service. Won't separate, harden, or thin out under varying driving and temperature conditions.

SINCLAIR LUBRICANTS-FUELS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

Hydraulic Truck-Brake Described in Catalog

The features of the Parkersburg Hydrotarder, designed to retard the down-hill momentum of large heavily loaded trucks, are described in an 18-page booklet. The device, which has found application in many industries using heavy trucks, is said to speed up schedules; increase revenues; save on gas, oil, tires, and engine wear; reduce brake maintenance; and provide greater safety and cargo protection.

Typical installations, diagrams to show how it can be applied to any truck, and other data are found in the brochure. Copies can be obtained on mention of this notice. Write the Parkersburg Rig & Reel Co., Parkersburg, W. Va.

Goodrich Promotions

New appointments announced by the B. F. Goodrich Co., Akron, Ohio, include the promotion of W. D. Jones to Manager of the Industrial Tire and Track Division, and of M. G. Huntington to Assistant General Manager of the Associated Tire Line Sales Division.

Mr. Huntington assumes the post held by Chester E. Carroll until his recent promotion to Division General Manager. The division merchandises the Brunswick, Diamond, Hood, and Miller lines of tires, tubes, and accessories.

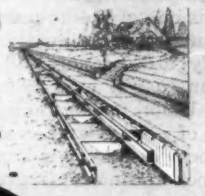
Mr. Jones succeeds Charles H. Kanavel, recently named District Manager for the Automotive, Aviation, and Government Sales Division at Los Angeles, California.

Tractors Build Ponds

Building farm dams "is an earth-moving job", the Caterpillar Tractor Co. says in a new brochure, "Pond Building with Earth-Moving Power". The 12-page pictorial booklet depicts the role played by Caterpillars in clearing dam sites, bulldozing, and scraper operations. The machines are shown building farm ponds in many sections of the nation.

Copies of the booklet can be secured on request. Write Caterpillar at Peoria 8, Ill., and ask for Form 9366.

FAST . . . LOW COST STREET PAVING WORK



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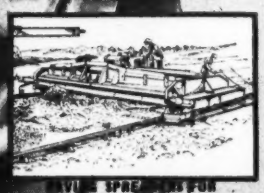
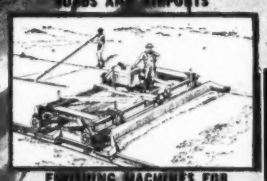
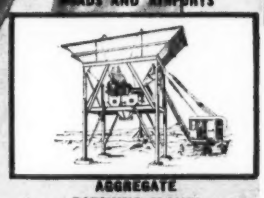
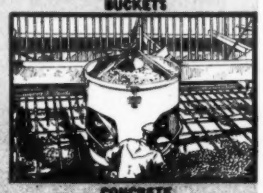

PAVING SPREADERS FOR ROADS AND AIRPORTS

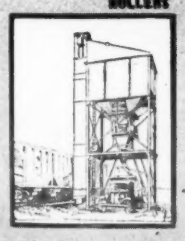

FINISHING MACHINES FOR ROADS AND AIRPORTS

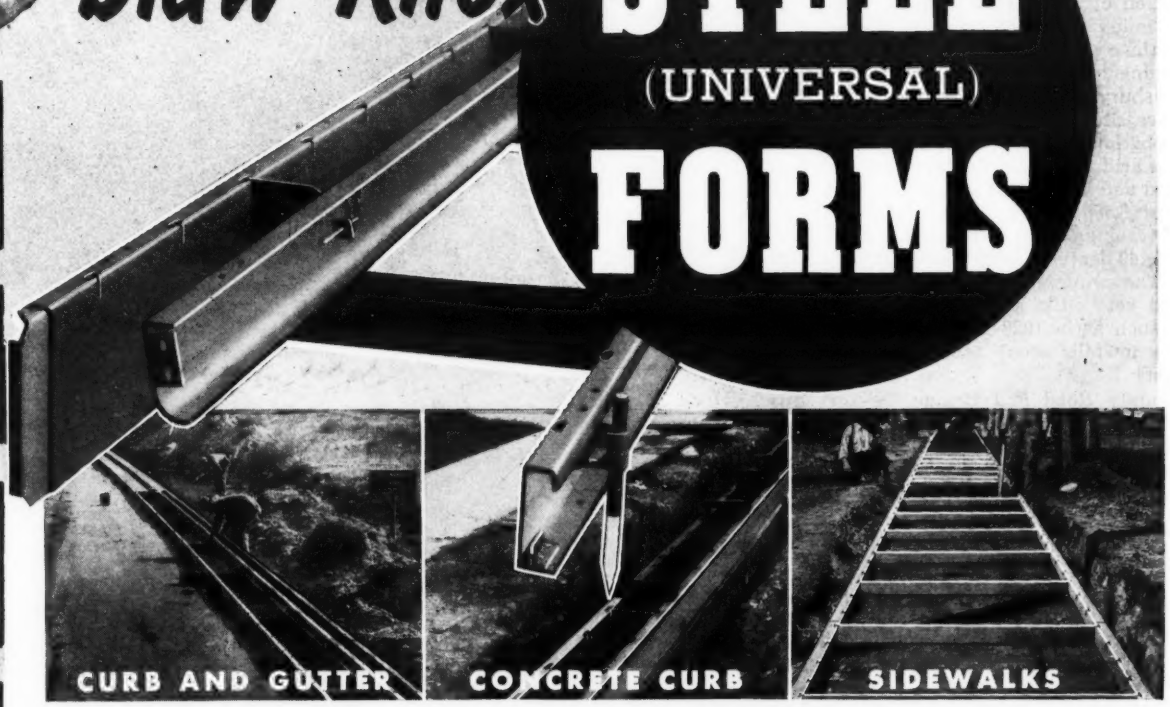

AGGREGATE BATCHING PLANTS

CLAMSHELL BUCKETS

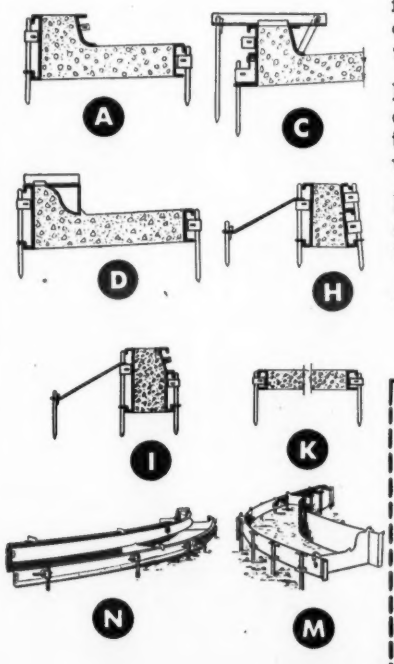

CONCRETE BUCKETS

SHEEPSFOOT TAMPING ROLLERS


BULK CEMENT PLANTS



From municipal paving — to real estate development — or for the occasional paving job.



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County Crews Build Roads and Bridges

Modern Equipment Helps To Maintain Facilities In Large Wyoming County; Future State-Aid Work

By DAVID P. MILLER, County Surveyor, Sweetwater County, Wyoming

✦ SWEETWATER County, Wyo., is located in the southwestern part of the state, and is one of the largest counties in the country, having an area of approximately 10,800 square miles. Traversed from east to west by the main line of the Union Pacific Railroad, it is the center of a very large coal-mining industry, besides having a large number of stock-raising enterprises and two districts where irrigated farming and ranching are practiced.

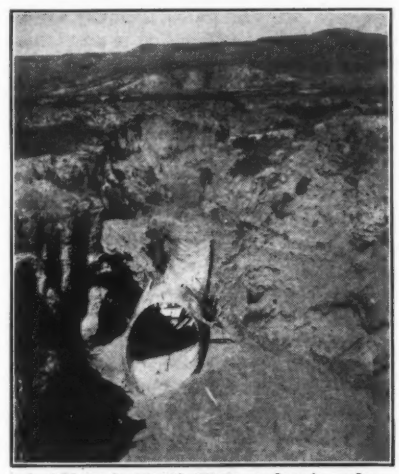
Green River, the county seat, is a division point for the railroad company and has a population of about 4,000. Rock Springs, the principal town, has a population of about 12,000 due to a wartime influx of people, and is the center of the coal-mining industry. The other mining towns of Reliance, Winton, Stansbury, Superior, Gunn, and Quealy are situated nearby.

The topography in this county is typical of the arid regions of the west, being rugged and barren with an average altitude of 6,500 feet, and with temperatures ranging from 100 degrees in summer to 40 degrees below zero in the winter. The winters are often quite open with very little snow, but occasionally, such as in 1928-29 and 1942-43, large snowfalls occur and plowing is necessary.

The County Road and Bridge Department is under the supervision of a three-man Board of County Commissioners who serve for a term of four years, and whose terms are staggered. The present Commissioners are Harry L. Armstrong, Dillwyn Ramsay, and A. L. McCurtain, all living in Rock Springs. The writer is the County Surveyor and Engineer, having served in this capacity for the past thirteen years.

Because of the proximity of the mining towns to Rock Springs and the relatively high traffic density on the roads serving these towns, it has been the County's policy to oil-surface such roads, and there are now about 75 miles of oiled roads in the county, exclusive of the state highway system. There are about 400 miles of graded and graveled roads serving the various rural communities, and a very large mileage of earth roads used by the stock-raising people in their search for feed for the many flocks of sheep that are grazed within the county.

The annual income accruing to the County Road and Bridge Fund amounts to approximately $130,000 per year, with about $70,000 as the County's share of the state gasoline tax, and about $60,000 raised by a general levy on property in the county. This is not a large sum to meet the demands of the existing road mileage and a large proportion of it is expended in maintenance, but the County has endeavored to carry forward a consistent program of improvement on the main county roads with modern road-building equipment.



A 135-inch Multi Plate culvert under construction in Sweetwater County, Wyo.

Bridge Work

The topography is very rugged, necessitating a fairly large expenditure for grading operations. In addition, the area is subject to flash floods or "cloudbursts" in the summer, when dry channels for short periods become raging torrents. The soil in some areas is a very fine alkaline clay, which erodes into vertical-sided ravines, requiring special treatment when bridged, due to the large amount of scour that takes place. In bridging these ravines a special procedure was developed whereby the channel is not constricted by any of the bridge structure, and long approach spans are made.

Standard-type modern bridge structures, a modification of the bridges designed for H-15 loading, used by the State Highway Department, and which fill the traffic needs admirably, have been developed and constructed in the county. These bridges are built of creosote-treated timber, using piles which are driven to refusal, and having lami-

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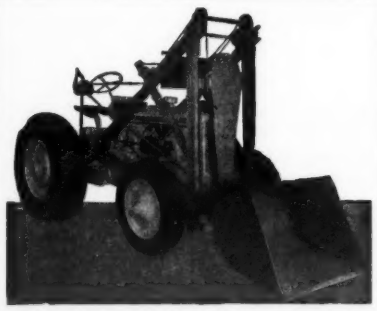

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County Crews Build Roads and Bridges

(Continued from preceding page)

nated 2 x 4-inch timber decks. All bridges are installed by the county's own forces, a regular crew being kept busy the year round.

A sufficient supply of bridge lumber, piles, culverts, etc., is kept on hand to meet any reasonable demand in emergencies. However, during 1937 these facilities were taxed to the utmost when severe cloudbursts forced the County to replace twenty-four bridges, most of which were outmoded.

County Roads

The County and State Highway Departments have had many cooperative projects during the past six years, wherein the County did the road location, grading, and drainage of a project, and the State participated in the placing of the base course, surfacing, and in the oiling operations. A low-cost surfacing method has been developed on these cooperative projects whereby an armor coat is placed on a 6-inch stabilized gravel base, using good-grade stone chips for the armor coat, after having prepared the base with a prime coat of about 0.5 gallon of MC-0 per square yard, and using a seal coat of 0.4 gallon of RC-3 per square yard. This has given good results in areas which are comparatively dry throughout the year.

Most of the grading operations are conducted by the County's own forces, for it has been impossible at this time to get competitive bids by contractors on the small projects which the County is forced to let due to limited funds. Two units are used in grading, a Caterpillar D7 tractor with a Gar Wood 9-yard scraper, and a D6 tractor with a LeTourneau Model G scraper. Another D6 tractor and ripper accompanies the units.

Maintenance operations are carried out by four Caterpillar No. 12, and one Austin Western No. 99 power grader, and an effort is made to get over the territory often enough to maintain all roads in a reasonably smooth condition. Thus the graders are in constant operation.

The maintenance shop and garage is located in Rock Springs, with a smaller shop in Green River. Three mechanics are employed full time in servicing the various units.

Due to the relatively high density of traffic on the roads, the County has been able to concentrate the work and funds on a comparatively small mileage, with the result that the county road system is in good shape. Also, practically all the operations are conducted with the use of modern engineering methods in design and construction, and despite the limited funds expended the results have been satisfactory.

During the war period, the County's activities were of course very much curtailed. The mines in the vicinity paid very attractive wages in comparison to the scale paid for construction,

Sweetwater County, Wyo., uses this standard type of bridge for spanning deep ravines which are subject to scour.

and as a result the County lost most of its labor force. It was also impossible to replace machinery, trucks, and parts, necessitating a resort to many expedients to keep the work going. At this time, the labor situation has taken care of itself, but machinery and parts are still difficult to obtain.

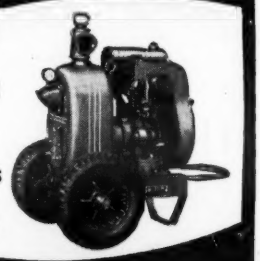
Future Plans

The 1944 Wyoming Legislature passed a law setting up a program of state-county cooperation in road construction. This is a different set-up from the Federal-Aid secondary program, and provision is made for financing projects on the basis of 67 per cent state funds and 33 per cent county funds. Sweetwater County has always cooperated closely with the State Highway Department, and now expects to participate in the new program to a large extent. It is anticipated that the last section in the road connecting Rock Springs with the Hiawatha natural-gas field will be oiled this summer. Parts of this road have been constructed under state-county cooperative projects beginning in 1940 and continuing to the present time. In addition, the road between Green River and the Burnt Fork district in the southwestern part of the county will be improved.

In these projects, as previously stated, the County will do the grading and construct the drainage facilities, and the State will surface the projects. This arrangement has worked well in the past, and with the aid of the new law it is expected that in time all the main roads in the county will be all-weather roads, and oil-surfaced.

Buy—and hold—U. S. Savings Bonds.

STERLING PUMPS



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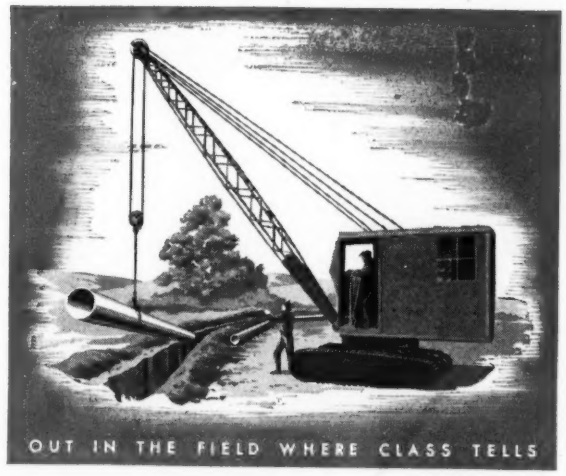
Sturdiness And Stamina In Chrysler Industrial Engines

RECORD* . . . With built-in precision and advanced engineering, Chrysler engines have demonstrated a sturdiness and stamina that meet the challenge of day-in, day-out gruelling use.

Chrysler designers and engineers introduced the compact, high compression engine—adapted it to various types of industrial uses — constantly improved it wherever possible.

Superfinishing of moving parts—originated by and exclusive with Chrysler—makes them practically wear-proof—increases efficiency of the engine and insures long life.



The most modern and efficient manufacturing equipment is employed to attain built-in precision. Rigid inspection proves the quality of materials and accuracy of processing before final release for various industrial power applications.

Thus—sturdiness and stamina are in-built characteristics of Chrysler Indusfrial Engines, assuring users safe, dependable, efficient and economical power.

*One of the 8 *character points* in the Chrysler Industrial Engine Pedigree

Meet The Challenge of Gruelling Use

To meet the power demands of modern industry in various fields of application an industrial engine must be more than just a good engine.

It must have a reserve of power and stamina for the strenuous jobs and added hours of continuous operation. It must keep going under unfavorable conditions —out in the field where exposed to the elements.

Chrysler Industrial Engines are "Horsepower With a Pedigree." They possess inherent qualities that enable them to meet the challenge of gruelling use. They are more than engines—they are units of "packaged" horsepower that can be depended on when the going is tough.

That's why they have been so successful in meeting the varied power requirements of tractors, shovels, cranes, pumps, air compressors, generator sets and other power applications in the construction industry.

Attention Dealers: Some desirable Chrysler Industrial Engine territories are available. Write to the Chrysler Industrial Engine Division for complete information.

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Horsepower with a Pedigree

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Please send the Chrysler Industrial Engine Catalog.
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Hewitt Rubber Renamed To Include Robins Firm

The stockholders of the Hewitt Rubber Corp. of Buffalo, N. Y., have approved a change in the firm's name. Henceforth it will be known as Hewitt-Robins Inc. This gives recognition to Hewitt's wholly owned subsidiary, Robins Conveyors Inc.

The manufacture of conveyor and transmission belts, foam rubber, molded-rubber goods, and industrial hose will continue at the Buffalo plants as an activity of the Hewitt Rubber Division. The engineering and manufacturing of conveyors and other materials-handling systems will be carried on at Passaic, N. J., by the Robins Conveyors Division.

Thomas Robins, Jr., President of Hewitt Rubber, was elected to the same post in the reorganized firm. All other officers were re-elected. Harold H. Von Thaden, First Vice President of Robins Conveyors, was named a Director of Hewitt-Robins, Inc.

Hot-Mix Specifications

Plan now for the highways of tomorrow, the Asphalt Institute urges in announcing that its recently published "Hot-Mix Manual" has been made available in four individual parts. Each part covers one of the subdivisions in the original volume.

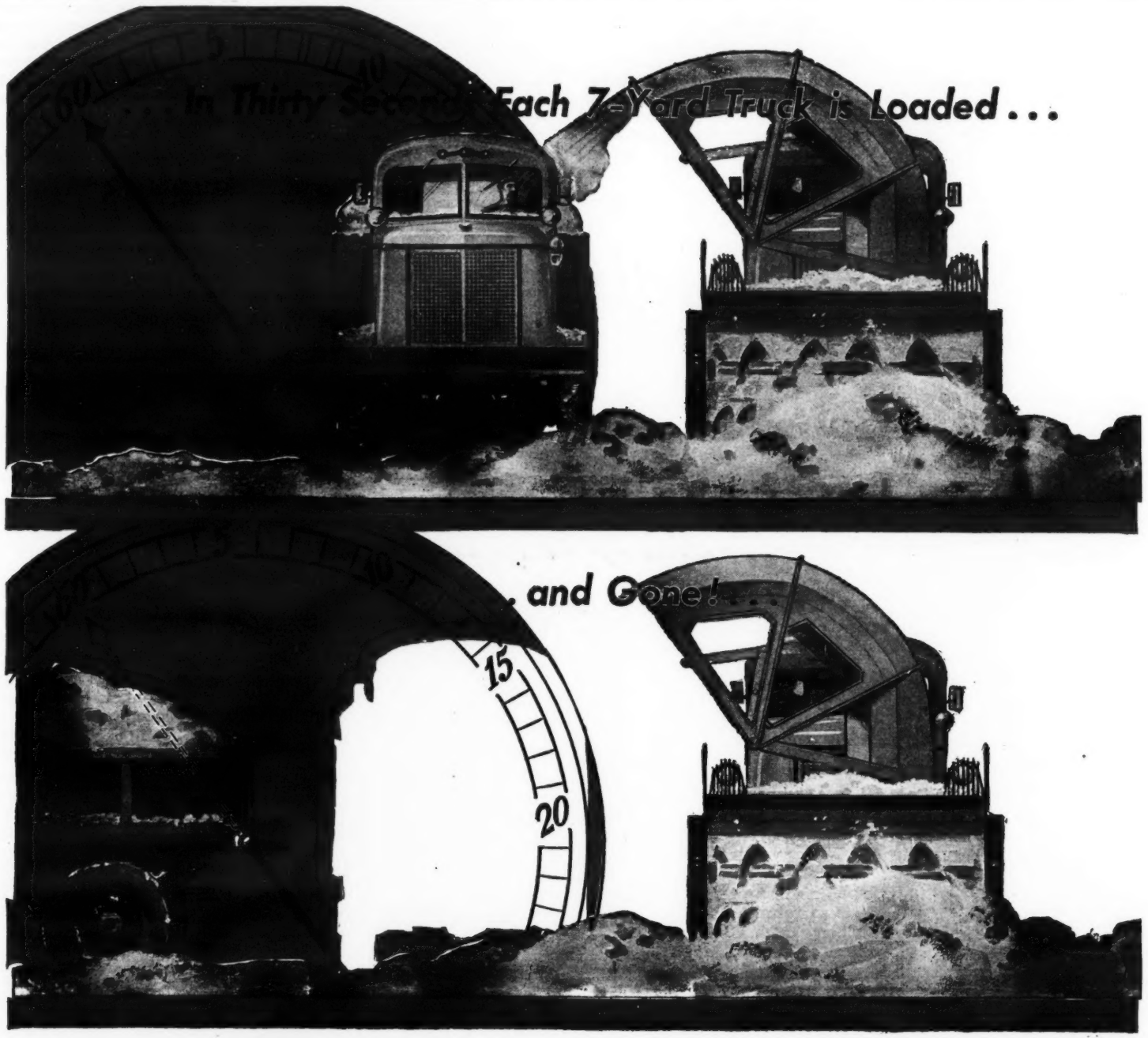
Part I, dealing with the recommended thickness requirements for hot-mix asphaltic-concrete paving, is now available in an attractive colored broadside, "Highways of Tomorrow". Parts II and III, on specifications for the dense-graded and graded-aggregate types of hot-mix hot-laid pavement, are printed in pamphlet form, as is Part IV, "Inspection of Hot-Mix".

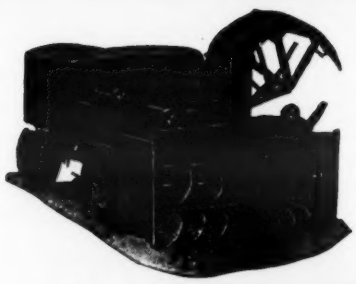
The two specification pamphlets are alternates and supersede older Institute specifications A-2 and B-8. Both include methods for testing mixtures, and job and plant-mix formulae.

These four publications, comprising Construction Series Nos. 73, 74, 75, and 76, can be secured without charge on mention of this notice. Write the Asphalt Institute, 801 Second Ave., New York 17, N. Y.

Detrex Advances Kroes

The appointment of L. C. Kroes as Central Regional Sales Manager has been announced by the Detrex Corp. of Detroit, manufacturer of equipment-cleaning supplies. He has been with the firm since 1937 and Manager of the Michigan Division since 1942.





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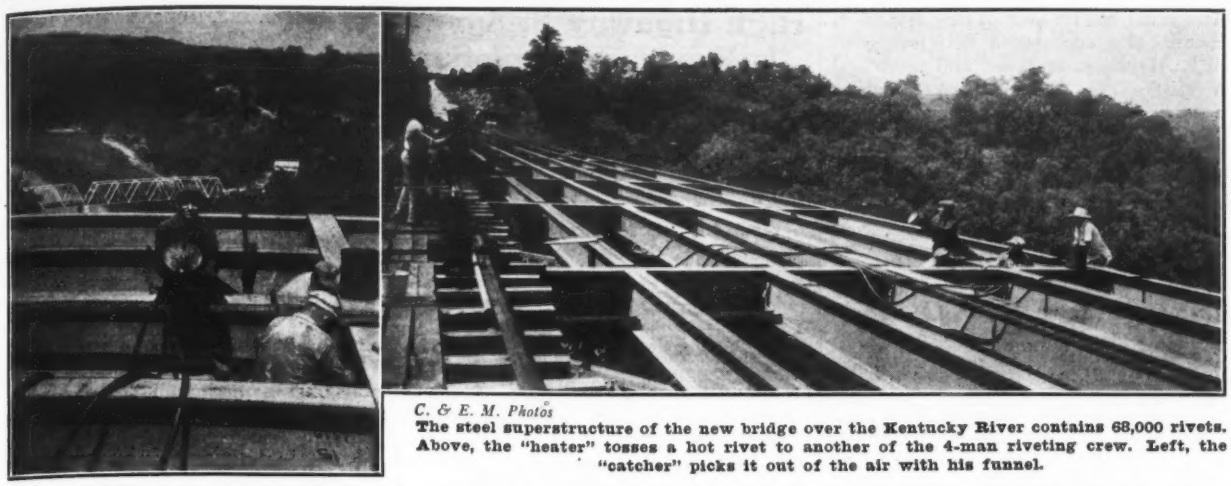
Address Enquiries to SICARD INDUSTRIES, INC., 753 WEST MAIN STREET, WATERTOWN, N. Y.



C. & E. M. Photos
The steel superstructure of the new bridge over the Kentucky River contains 68,000 rivets. Above, the "heater" tosses a hot rivet to another of the 4-man riveting crew. Left, the "catcher" picks it out of the air with his funnel.

High Highway Bridge Is Nearing Completion

(*Continued from page* 2)

ing of the 68,000 rivets was a long-drawn-out task. Some riveting was done for about 10 days in December, 1944, but unfavorable weather and the difficulty of getting men who could work on such a high bridge job deferred further activity until April, 1945. From then until the riveting was finished in October, two riveting crews were employed, except from July 1 to August 20 when only one crew was working; each 4-man crew drove an average of 225 rivets in a 9-hour day.

An Ingersoll-Rand 210-cfm two-stage air compressor was set up at the end of the bridge to supply air through a pipe line to the Boyer riveting hammers. The rivets were heated on a Champion hand forge set up on a catwalk, and were tossed by the "heater" to the "catcher" who removed the red-hot rivet from his funnel with a pair of tongs and inserted it in the rivet hole. The third crew member, the "bucker", held the rivet in place while the "driver" made a button at the shank end. Most of the rivets are ⅞-inch, fitting into 15/16-inch holes; over the central piers, however, 1-inch rivets and 1 1/16-inch holes were used.

The principal construction item in the Mount Vernon Bridge Co. contract was the structural steel, which contains 0.2 per cent of copper, added to improve the rust-resisting qualities of the carbon steel. The major items were:

Structural steel	4,802,242 lbs.
Lead plates (between masonry and bottom of shoe plates)	1,745 lbs.
Wrought-iron pipe drains, 6-inch	1,400 lin. ft.
Timber for inspection walk	6,384 MBM

For the contractor, H. W. Smith was Superintendent and L. P. Lambrou was Field Engineer.

Grading Approaches

Work on the approaches started in October, 1942, when the Codell Construction Co. of Winchester, Ky., was awarded a grading contract involving over 250,000 yards of excavation on its low bid of $247,436.08. The length of the approach on both the north and south sides is 3,300 feet. But the bulk of the excavation was at the south end of the bridge where 222,419 yards was removed to make a 90-foot cut. About 210,000 yards of this amount was wasted in low areas at the south end of the old bridge.

On the north side the approach has been temporarily surfaced with gravel 22 feet wide and flanked by 8-foot shoulders. On the south side, which has a 6 per cent grade for 1,600 feet of its length, the roadway was widened to provide room for a 33-foot pavement; the extra lane is to be used by slow-moving traffic climbing the hill. The major item in this contract was the excavation which totaled 266,706 cubic yards; work was completed in July, 1943.

Concrete Spans

R. R. Dawson, a Bloomfield, Ky., contractor, was awarded the final contract to construct the five reinforced-concrete deck spans, a concrete deck on the steel spans, and a concrete railing, together with the abutment and first pier at the south end which had been left out of the original substructure contract. The concrete deck is 7½ inches thick and is supported over the five steel spans of the bridge by six girders 3½ feet deep. Harold Strunk is Superintendent on this $166,162.70 contract which includes

(*Concluded on next page, Col.* 3)

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ANCHOR has designed a compact, streamline, clamp type reusable coupling for emergency repair and field service. No special tools are required to assemble the coupling on hose. No replacement parts to be ordered when installing new hose. These reusable couplings keep permanent grip on two wire braid high pressure hydraulic hose.

As usual we feature assembled lengths of high pressure hydraulic control hose with factory applied pressed-on couplings. Also medium pressure and low pressure constructions. Hose sizes are 3/16" ID to 1½" ID inclusive.

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Advantages of EUCLID Planetary Drive Axle

The driving parts of the Euclid axle are: (a) — a primary reduction consisting of conventional spiral bevel ring gear, pinion and differential (1); (b) — secondary reduction of two floating planetary gear sets (2) each made up of a sun gear, three planetary gears and internal ring gear (3). The only parts carrying the full driving load are the outer drive axles and hub caps (4). The inner axles (5) carry less than 1/5 of the load delivered to the driving wheels (6). The use of the planetary reductions makes possible minimum gear reductions in the transmission and differential and results in much lighter loads being imposed on all parts between the planetary gears and engine.

Full-floating drive axle has exceptional strength

One reason for the wide use of Euclids on tough, off-the-highway hauls is the double reduction planetary drive axle used in both Rear-Dump and Bottom-Dump Euclids.

By this system of gear reduction, tremendous pulling power is attained with comparatively little burden on the intermediate driving parts. This results in greatly prolonged life of axle driving parts.

The Euclid drive axle is full-floating — all of the rear axle load being carried on heavy-duty tapered roller bearings mounted on hollow spindles which keep axle shafts and gears entirely free from vehicle and payload weight. The entire drive axle assembly is precision built and all working parts are completely enclosed in an oil bath.

The dependable performance of the Euclid axle — its strength and capacity — is unequaled by any other axle in heavy duty hauling equipment. It is an important factor in the long life and efficiency of Euclids.

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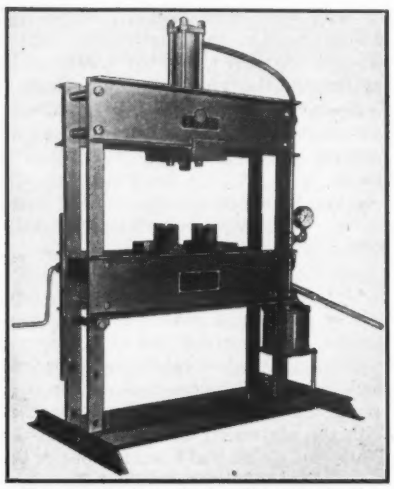


The new Rodgers hydraulic press is designed to perform a wide variety of shop operations.

Hydraulic Shop Press Has 60-Ton Capacity

A new hydraulic shop press, announced by Rodgers Hydraulic, Inc., has a 60-ton capacity. The machine is said to be capable of performing a wide variety of shop operations: among them, pressing, straightening, shearing, bending, clamping, riveting, broaching, and assembly work. Fast operation, ruggedness, versatility, and a capacity for large-size work are cited as features of the new press.

A 2-speed hydraulic hand pump supplies power for the ram. In high speed, this moves the ram 2½ inches per pump stroke, giving up to 2,000-pound pressure in fast travel. The pump's lever can be flipped quickly for high-pressure operation. The ram travels a full 13 inches at a continuous stroke, due to the long cylinder. This cylinder rests on rollers which ride the flanges of the upper bolster, and so can be moved across the entire working width of the press.

Press flexibility is possible through a hand crank for adjusting the lower bolster's height. The maximum bolster opening is 38 inches, and the minimum 8 inches. There is a 45-inch working width between the sides, but long pieces can be handled through the open sides any place above the globe valve and pump.

The pump, globe valve, and a gage marked in tons and pounds, are located on the lower right side of the press.

The press has an overall height of 88¾ inches, and requires a floor space of 38 x 70 inches. Matched and machined V-blocks are furnished as standard equipment, while other special attachments are available.

Complete details on this new Rodgers press can be secured by writing Rodgers Hydraulic, Inc., 7415 Walker St., St. Louis Park, Minneapolis 16, Minn. Mention this news item.

Distributor's New Office

A new office building has been completed at 1815 Kentucky Ave., Indianapolis 3, by the Reid-Holcomb Co., Indiana distributor of construction equipment. Built on a 2½-acre site, the new quarters has truck and railroad platforms, storage and parking space, enlarged showrooms, a parts department, and modern shop facilities. Ralph Reid and Glenn P. Holcomb are principals in the firm, with Jesse Hunt, Red Hamlin, Miller Schooling, and William England as their associates.

High Highway Bridge Is Nearing Completion

(Continued from preceding page)

the following major items:

Excavation	600 cu. yds.
Concrete, Class A	2,120 cu. yds.
Steel reinforcement	428,560 lbs.

When the concrete work is completed this summer, the steel will be painted with two coats of white lead, and the approaches will be paved, using the gravel for a sub-base. The bridge will then be open for traffic.

Personnel

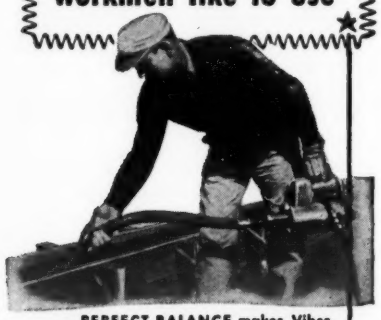
This major project of the Kentucky Department of Highways was designed by the Bridge Division, H. R. Creal, Bridge Engineer, and E. D. Smith, Assistant Bridge Engineer. The Department of Highways is headed by J. Stephen Watkins, Commissioner, and Thomas H. Cutler is State Highway Engineer. H. H. Catching is District Engineer and the Resident Engineer on the bridge is T. J. Hopgood. Half of the cost of the construction will be paid for by Federal-Aid funds. The Public Roads Administration is represented in Kentucky by Mack Galbreath, District Engineer.

New Hydraulic Units

Two new units for hydraulic-powered equipment have been announced by the John S. Barnes Corp. Each is built so that the customer can mount his own motor, or have Barnes mount one for him. The smaller hydraulic unit, F-10-A, for light-duty machine applications, has a maximum pump delivery of 5 gpm, and a gage pressure of 500 psi. The maximum pump delivery for the large model, F-20-A, is 12½ gpm. This unit has a maximum gage pressure of 1,000 psi.

Bulletins 303-U and 304-U, which describe these units, can be obtained on mention of this notice. Write the John S. Barnes Corp., 301 So. Water St., Rockford, Ill.

The VIBRATORS workmen like to use



PERFECT BALANCE makes Viber Vibrators so easy to handle that better workmanship results—and faster work schedules may be maintained. VIBERS give you a constant, smooth speed of **9,500 RPMs IN CONCRETE**—the highest ever offered. Vibers are flexible, yet rugged, and all elements are interchangeable, including electric, pneumatic and gasoline motors.

THE VIBER COMPANY
726 So. Flower St., Burbank, Calif.

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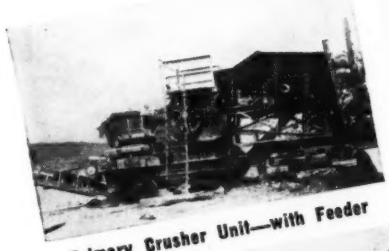
HI-SPEED CONCRETE VIBRATORS
ORIGINATORS OF INTERNAL CONCRETE VIBRATION!

crushed . . . sized . . . washed
to fit any specification from rip rap stone to agstone
Cedarapids UNITIZED PLANT



Primary Crusher Unit—with Feeder

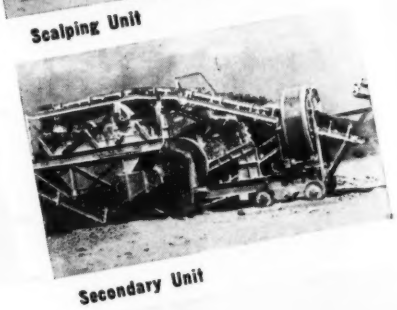
For crushed stone when big stone has to be reduced to 1½" — and a certain size is to be scalped out. Use Units 1, 2 and 3.

Complete Crushing, Screening and Washing Plant. Use Units 1, 2, 3 and 4.

Scalping Unit

For crushed stone when finer sizes are not required — 25" rock down to 1½". Use Units 1 and 3.

For crushed stone when medium sized stone has to be reduced to 1½" — and a certain size is to be scalped out. Use Units 2 and 3.



Secondary Unit

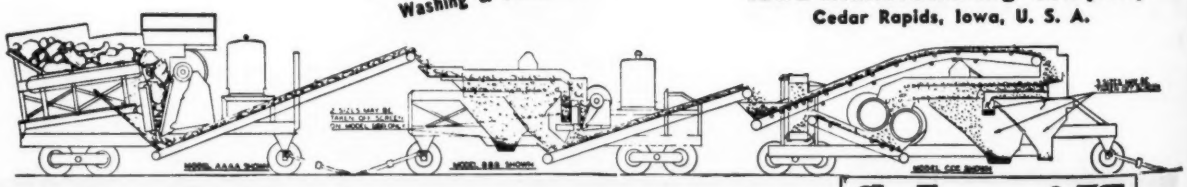
For crushed gravel. Use Unit 3 alone.

For washed gravel. Use Units 3 and 4.

Washing & Sizing Unit

Each element of the Cedarapids Unitized Plant is a complete unit in itself balanced for high capacity and low cost, used alone or in any one of dozens of different combinations of matched units. You can start with a tandem straightline secondary plant and produce crushed gravel and add the other units as your demands increase. You can use a roll crusher, cone crusher, twin jaw crusher or Hammermill in the Secondary Unit. Each unit is portable so you can move just the equipment needed to do any particular job. Get the complete story from your nearest Cedarapids distributor. There's a size and type to fit every production requirement both as to volume and finished products. When buying a crushing plant—buy the best—buy Cedarapids.

Iowa Manufacturing Company
Cedar Rapids, Iowa, U. S. A.



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ROCK AND GRAVEL CRUSHERS
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PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS

Grading and Paving On Road Relocation

Dual Highway Built Close To River Level, Avoiding Sidehill Cuts; Concrete Laid on Slag Base Course

+ A 2¼-MILE section of Ohio River Boulevard, main artery between Pittsburgh and the suburban communities along the east side of the Ohio River, has been relocated on a new water-level route. The improvement was undertaken to replace a portion of the existing highway built into a hillside which had been causing serious trouble with slides. The construction began in Leetsdale, Allegheny County, about 14 miles northwest of Pittsburgh, and extended to Ambridge, just over the line in Beaver County. Originally conceived as necessary war construction because of the importance of the boulevard as an access road to war industries located along the Ohio, the contract for this project was awarded in 1944 by the Pennsylvania Department of Highways to the Booth & Flinn Co. of Pittsburgh, Pa.

The original highway, State Route 88, had an average width of 27 feet, and was constructed of brick through the towns and concrete in the open country. It had taken a terrific pounding from heavy traffic during the war, since it is the only through route between Pittsburgh and the huge marine shipbuilding plant of the American Bridge Co. at Ambridge on the Ohio. The new dual highway is 100 to 800 feet away from the old road in the direction of the river. It closely parallels the tracks of the Fort Wayne Division of the Pennsylvania Railroad running along the right bank of the Ohio. Each of the dual roadways is 24 feet wide, of 9-inch reinforced concrete; they are separated by a 4-foot median strip. A 6-inch layer of slag was laid as a special subgrade for the concrete pavement.

Grading

With the exception of short stretches at each end of the project where tie-ins are made to abutting streets in Leetsdale and Ambridge, the entire job was a relocation entailing more than 200,000 cubic yards of excavation, with less than half that amount needed for fill. Because the new right-of-way was cut into the toe of hills rising 200 to 250 feet above the level of the valley, which in this area is extremely narrow, road construction was costly and laborious. Thirty-two houses had to be moved from the right-of-way before grading was started on January 20, 1944, and a considerable amount of shifting of the lines of public and private utilities was necessary in this highly industrialized area.

The soil is a mixture of sand and clay which became very difficult to work in during the excessive rains of the spring and summer of 1945. This difficulty was augmented by the heavy run-offs from the hillsides which drained into the construction area. In shallow cuts the contractor employed three LeTourneau 14-yard scrapers pulled by Caterpillar D8 tractors for hauls up to 1,000 feet without the use of pushers either in loading or dumping. In the heavier cuts, which averaged 30 feet in depth, two Lorain 1¾-yard shovels, Models 79 and 80, were used for excavating. The material was hauled away in four 8-yard end-dump Euclids and a fleet of from ten to fifteen Dodge trucks averaging 3 cubic yards each. The average haul of this equipment was between 1,500 and 2,000 feet.

C. & E. M. Photo
Wood piles to support the abutment footings for the Big Sewickley Creek bridge on Booth & Flinn's 2¼-mile highway contract on Pa. Route 88 were handled by a Manitowoc Speedcrane.

Only about 85,000 yards of compacted fill was placed from the excavation; the rest of the material had to be wasted. The fill was laid in 4-inch layers, wet down by sprinkling from a water wagon when necessary, and rolled by a dual-drum sheepsfoot roller which had feet with an area of from 5 to 7 square inches and was pulled by a Caterpillar D7 tractor. The subgrade was given a final rolling by a Buffalo-Springfield 10-ton 3-wheel roller. During the grading, the inside edge of the roadway was kept a

(Continued on next page)

Get Faster—Steadier HEATING OF ROAD OIL when you install HAUCK BURNERS on Your Distributor-Trucks

Reliable—Efficient

Hauck Oil Burners of the kerosene vaporizing type on hundreds of distributor-trucks give clean, steady, smokeless flame of proper intensity. Operate an entire season without need for cleaning. Heater coils of burner are made of seamless steel tubing, non-scaling. Cast nozzle protects coil from most intense heat, prolonging effective service. Four sizes for 3" to 8" firing tubes.

A contractor writes, "On our fleet of distributor-trucks they give us a quicker temperature rise and steadier heat than other burners that we have tried."

For special applications Hauck Venturi Low Pressure Fuel Oil Burners can be obtained only through distributor-truck manufacturers whose trucks are provided with the blower and pump equipment to operate this type.

Also write for catalogs on Torch Flame Burners ● Melting Kettles ● Asphalt Tool Heaters ● Asphalt Surface Heaters ● Compound Melting Furnaces ● Concrete Heaters ● Steam Generators ● Rivet Forges

HAUCK MANUFACTURING CO.
116-126 Tenth St., Brooklyn 15, N. Y.

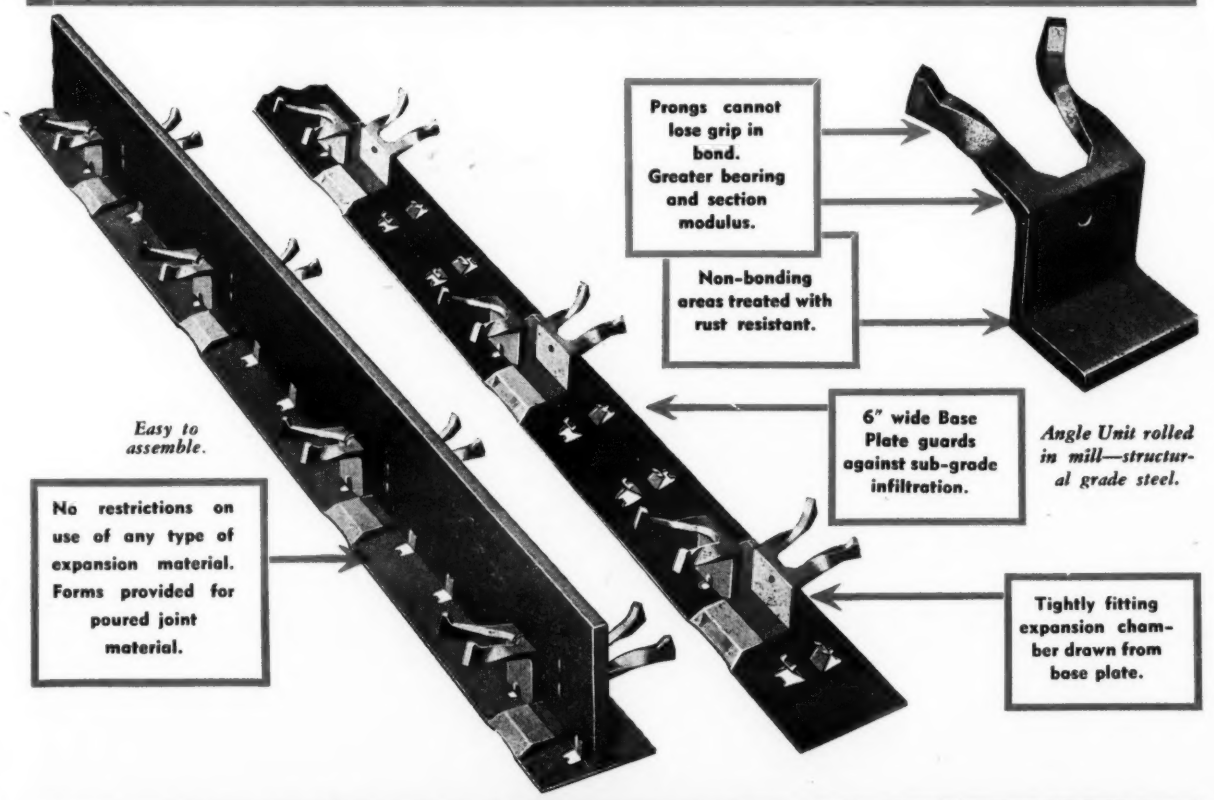
TRANSLODE EXPANSION JOINT

The continued effort on the part of Highway and Airport Engineers for smoother pavements has always enlisted the interest and cooperative efforts of Highway Steel Products Company. The essential requirements of a load transfer device to permit unrestrained expansion and contraction and to hold the abutting edges at an even and smooth surface are achieved with Translode joints.

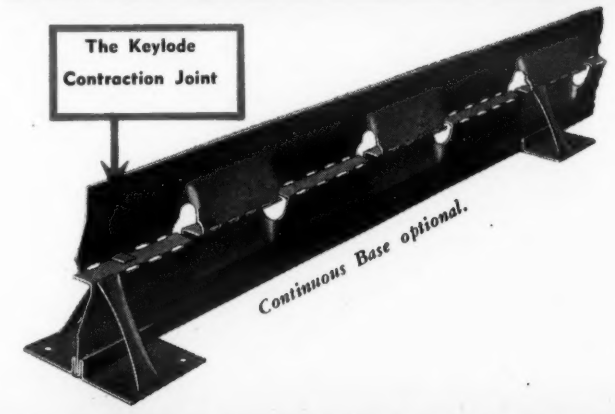
The functional life of the Translode Expansion joint is designed for the life of the pavement. The non-bonding area of the load transfer Zee bar units are treated with a rust resistant.

The ease of assembly and installation add to the economy of specifying Translode. The continuous base plate solves all problems of installing joints on granular and pin resisting subgrades. The rigidity of the Translode assembly insures against accidents in handling. The ease and simplicity of alignment assure better looking pavements.

The Translode joint offers no delaying factor to the employment of modern concrete spreaders and finishing machines.


Prongs cannot lose grip in bond. Greater bearing and section modulus.
Non-bonding areas treated with rust resistant.
6" wide Base Plate guards against sub-grade infiltration.
Angle Unit rolled in mill—structural grade steel.
Easy to assemble.
No restrictions on use of any type of expansion material. Forms provided for poured joint material.
Tightly fitting expansion chamber drawn from base plate.

KEYLODE CONTRACTION JOINT



The Keylode Contraction Joint has these features:
(1.) Tests of opened joints in Shear prove Keylode superiority.
(2.) Greater bearing surface of alternating, interlocking six-inch pockets provide positive, continuous load transfer.
(3.) Abutting ends of slabs are molded into glass smooth surfaces that eliminate the grinding action of rough concrete faces.
(4.) Pavement surfaces cannot fault at joints. The Keylode will not allow independent deflection of slabs.
(5.) Has no resistance to warping in any direction.
(6.) Low in cost permitting spacing for positive crack control without increasing pavement cost.
(7.) Simplicity of installation reduces costs of placement to minimum.

HIGHWAY STEEL PRODUCTS CO., CHICAGO HEIGHTS, ILL.

Grading and Paving On Road Relocation

(*Continued from preceding page*)

little higher than the outside so that water would drain off in the direction of the river.

In wasting material, enough low areas were fortunately available to make hauls beyond the limits of the job unnecessary. Much of the excess excavation was dumped along the banks of Big Sewickley Creek which divides Beaver and Allegheny Counties, around the transformer yard of the Duquesne Light Co., and in low places on the property of the Bethlehem Steel Co. An average of 2,400 yards of earth was moved in a 9½-hour day.

Trouble With Slides

During the early months of 1945, landslides developed in the midst of grading operations at the toe of the long slopes. They endangered the existing road, which was cut into the hillside about 50 feet above the new roadway. As the shovels dug into the foot of the slopes, the effects of this undermining were felt from the bottom to the top of the hill. Cracks varying in width from mere hairlines to gaps 3 and 4 feet wide appeared in the surface of the ground. A stone retaining wall built along the old road broke in several places, and the subgrade under the outside edge of the existing pavement began to run down the bank.

To preserve the old road for the use of traffic while the new one was being constructed, the contractor dug back into the hill to widen the old roadway. He also laid a temporary bituminous pavement to maintain the original width. Thus even if some width was lost along the outside edge because of sliding, it was made up by the additional width cut into the hillside. Extra compensation was given the contractor for this work, as the State wished to hold the old road and return it to the borough of Leetsdale for use as an alternate parallel route. One slide during the latter part of July, 1945, was of such proportions that Route 88 had to be closed to traffic until the earth was hauled away.

Slag Base Course

The new roadway is well drained. An adequate system of concrete pipe and tile underdrain was laid in trenches excavated by a Michigan ⅜-yard shovel. When this was completed, a 6-inch layer of slag was laid as a special base course for the new pavement. The source of the run-of-crusher slag was the Jones & Laughlin steel plant 7 miles down the river at Allquippa. It was bought from the Duquesne Slag Co. which gave the hauling contract for the slag to the Robinson Trucking Co. of Pittsburgh, and the material was brought to the job in three White trucks carrying 10 tons each.

After being dumped, the slag was spread by a Caterpillar D6 tractor-dozer, graded carefully by a Caterpillar No. 12 power grader, and rolled by a Buffalo-Springfield 10-ton 3-wheel roller. On top of this course was added a 1-inch layer of slag dust. If too much dust was added, the intended use of the slag course as a drainage mat would be destroyed, as water could not percolate through it. On the other hand, if an insufficient amount of dust was added, the slag would absorb too much water from the concrete during the paving operations and thereby weaken the slab.

Two Bridges

Included in this contract were two bridges: a reinforced-concrete arch bridge carrying the dual highway over Big Sewickley Creek at the county line; and a concrete and steel underpass at Leet Street, which carries an access road to the American Bridge Co. plant over the new highway and the paralleling tracks of the Pennsylvania Railroad. Built in soft ground, both structures required a considerable amount of piling, wood, steel, and concrete for foundation bearing.

The tied arch has a 40-foot span with a rise of 13½ feet from the spring line. Excavation for the two concrete abutments, 82½ x 13 x 4 feet deep, was done by a Manitowoc Speedcrane, with a 65-foot boom and a Williams 1½-yard clamshell bucket, working on timber mats. Nearly 400 wooden piles were driven to support the abutment footings, using the same crane with the addition of 54-foot leads and a No. 2 Vulcan 2½-ton steam hammer. Steam was supplied from a 34-hp vertical coal-burning boiler. The piles averaged 36 feet in length, 12 inches at the butt and 8 inches at the tip which had metal-pointed shoes. They were driven to 18-ton bearing and were cut off at such an elevation that they project 12 inches into the footings.

Then an earth dam was thrown up by the crane to divert the creek channel first to one side and then to the other side of the structure. Water was pumped out from the footing excavations by two Rex 6-inch pumps so that wooden forms could be constructed. A small wood frame structure, 12 x 18 feet, was built and equipped with a 30-inch band saw driven by a 2-cylinder gas engine, and a table saw with 16 and 20-inch circular blades powered by a Le Roi gasoline engine. The wooden forms were cut and trimmed by this machinery and finished by hand tools on a work bench running along one side of the small sawmill. Additional equipment included two Mall chain saws for cutting timbers, and a Chicago Pneumatic drill for boring holes.

Ready-mixed concrete was furnished by the Dravo Corp. of Pittsburgh from its batching plant ½ mile from the south end of the project on the Ohio River. It was delivered in five Jaeger truck-mixers mounted on International and Mack bodies. The mixed concrete was chuted into a 1-yard concrete bucket which was discharged into the forms by the crane. The concrete arch has a

(*Continued on next page*)

You get all 3—with the model A-D

POWER 75 Diesel horsepower—more than enough for the toughest kind of work. 2-cycle engine efficiency and economy.

TRACTION 21,500 lbs. total weight... with 15,660 lbs. concentrated on the four rear Tandem wheels, that drive together... as a unit!

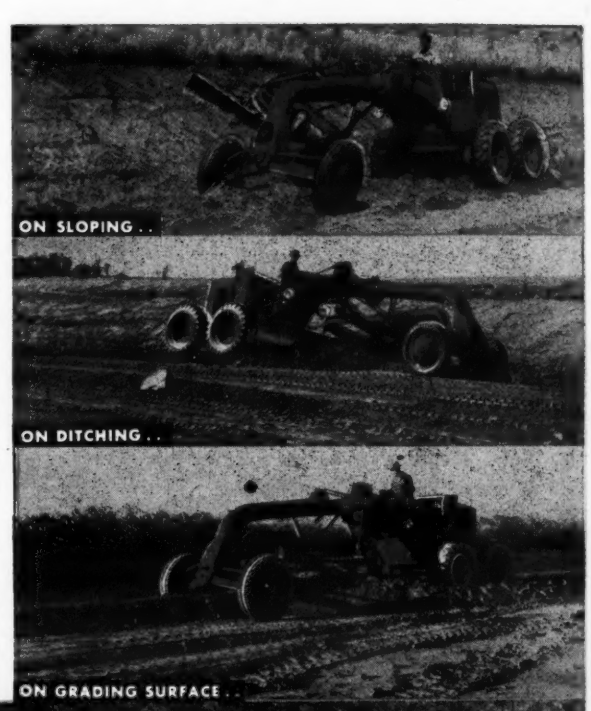
CLEARANCE 22-inch front axle clearance allows material to flow freely to moldboard—no hanging-up on windrow, no wasting h. p. pushing a dead load.

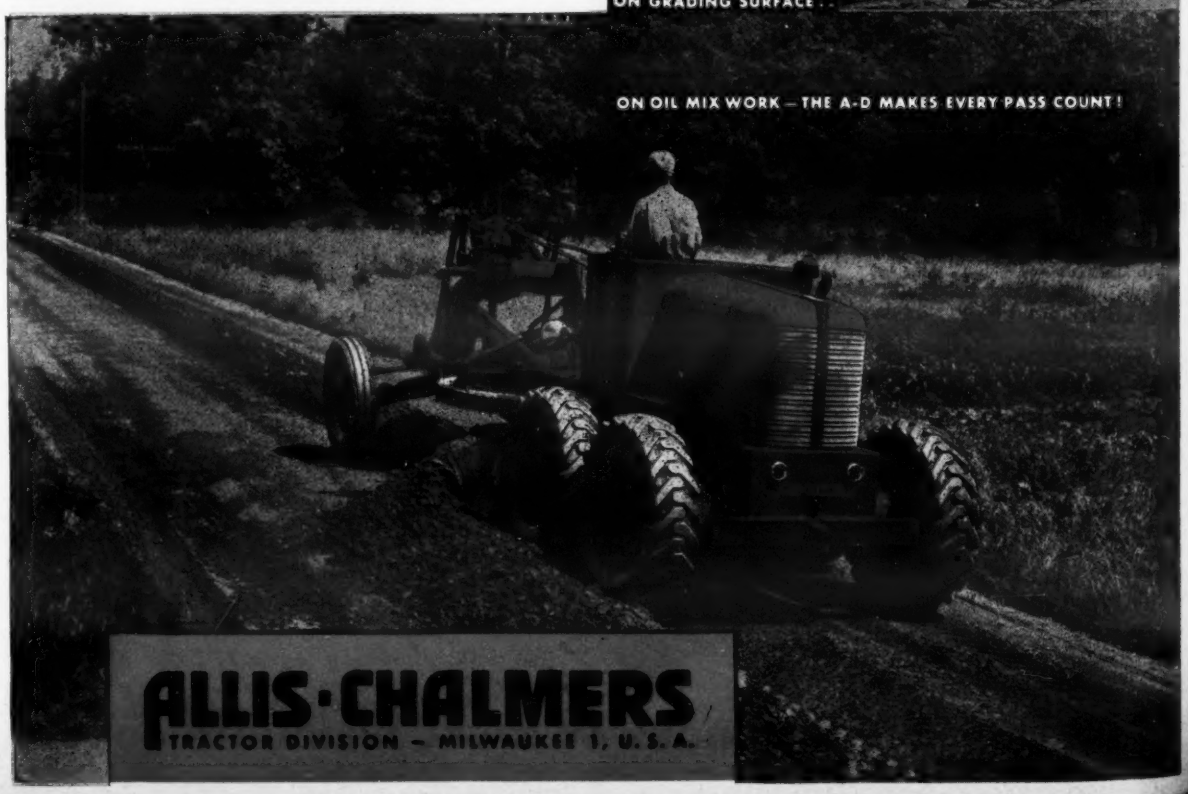
Plus a full range of blade positions and leaning front wheels to handle all types of grading with ease.

Plus simplified operation—easier steering and control, electric instruments, electric brakes, full operator comfort.

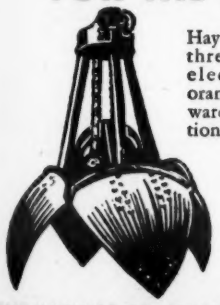
Plus a larger capacity, longer life, easier-to-operate clutch... gears that automatically lock in place... a tubular frame that resists all twists and strains.

Together these Model A-D features mean more work done, more accurately, at lower cost . . . a better job on every job!





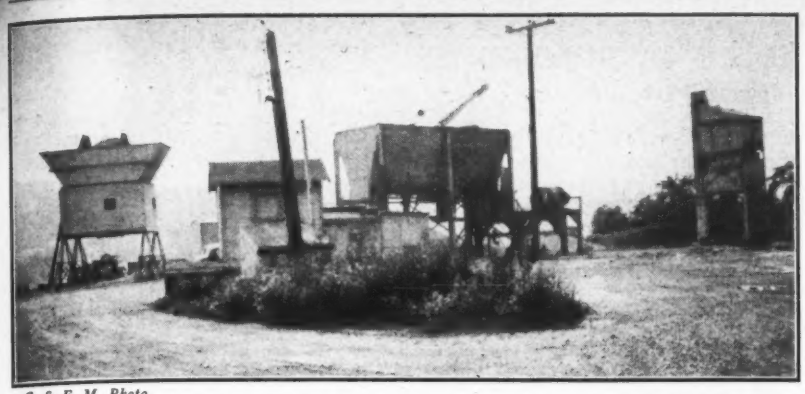
USE RIGHT BUCKET FOR THE JOB



Hayward makes all three—clamshell, electric motor, orange peel. A Hayward recommendation is unbiased.

THE HAYWARD CO., 32-36 Dey St., New York

Hayward Buckets



C. & E. M. Photo
The batching plant which furnished the concrete for the Booth & Flinn 2¼-mile highway project consisted of a 105-ton aggregate bin (at left) to serve the batch trucks for the paving, a three-compartment bin in the center for delivering aggregate to the truck-mixers, and a Blaw-Knox 300-barrel cement bin, at the right.

Grading and Paving On Road Relocation

(Continued from preceding page)

21½-foot radius, and is 1 foot thick at the top and 3 feet thick at the sides. The materials required in its construction included:

Concrete	1,233 cu. yds.
Steel reinforcing	52,088 lbs.
Timber piles	15,960 lin. ft.

The Leet Street underpass has a 68-foot span and a vertical clearance of 17 feet. Its concrete abutments are supported on 67 Monotube steel-shell piles filled with concrete, while the floor slab of the bridge consists of 3½-inch steel I-beams encased in concrete. The major items on this structure were:

Excavation	445 cu. yds.
Concrete	336 cu. yds.
Reinforcing steel	26,111 lbs.
Structural steel	167,000 lbs.
Monotube piles	2,022 lin. ft.

Batch Plant

Concrete material, both for the structures and the pavement, was purchased from the Keystone Sand Division of the Dravo Corp. of Pittsburgh, which already had a batch plant set up on the right bank of the Ohio for some prior concrete-paving jobs on State Route 88. Sand and gravel for aggregate were taken from the Ohio River and brought to the plant in barges, where they were unloaded by a Dravo whirley electric crane with a 75-foot boom and a Williams 1½-yard clamshell bucket. Power for the crane, which was set up on pile cribbing at the edge of the river, was obtained from a nearby electric line.

At one end of the plant was a large 105-ton bin divided into three compartments of equal size which the crane loaded with sand and two different grades of gravel for use in the concrete paving. At the center of the plant was another aggregate bin, also with three compartments each holding 40 yards of the same material, which supplied the truck-mixers carrying mixed concrete batches for the structures. On one side of this bin, mounted on a wooden platform, was a 2½-yard drum from a truck-mixer which contained water for mixing the batches.

In the paving operations batch trucks backed under the large bin at the end of the plant to pick up the sand and gravel. They then drove under a Blaw-Knox 300-barrel cement bin at the other end of the plant for their load of cement, and continued on a wide loop which led back a few hundred feet to State Route 88, at a point about ½ mile from the south end of the job. The truck-mixers drove under the aggregate bin assigned to their use for sand and gravel, got their tanks filled with water, and then picked up the cement. Cement was purchased from the Universal Atlas Cement Co. at Universal, Pa., 30 miles away. It was delivered in bulk cars to a siding at the batch plant via the Pennsylvania Railroad and a track in the yard of the Bethlehem Steel Co. plant which was only about 500 feet from the cement bin. The bin was loaded by the conventional screw in a trough at the middle of the track siding and an enclosed bucket elevator.

Concrete Paving

The dry batches for the concrete paving were mixed in a Rex 27-E paver in 1:1.7:3.5 proportions and delivered to Heltzel steel road forms of which the contractor had 4,000 feet on the project. Paving started in August and 0.87 mile was laid. Then wet weather and sliding conditions delayed completion until this season. The gradations of the sand and gravel used in the paving were as follows:

Sieve Size	Per Cent Passing 3A Gravel	2B Gravel	Sand Type A
2½-inch	100	.....	.....
2-inch	98-100	.....	.....
1½-inch	35-70	.....	.....
1¼-inch	.....	100	.....
1-inch	0-15	90-100	.....
½-inch	.....	20-50	.....
⅜-inch	.....	.....	100
No. 4	.....	0-10	95-100
No. 20	.....	.....	35-65
No. 50	.....	.....	5-30
No. 100	.....	.....	0-8

The concrete was paved in 12-foot lanes with an expansion joint every 122 feet, and a contraction joint at the midpoint of these slabs. These load-transfer joints, both expansion and contraction, were fabricated by the Electric Welding Co. at its McKees Rocks, Pa., plant and delivered to the job, 12 miles away, by truck. The expansion joints are made of bituminous-impregnated paper, ½ x 8½ inches thick, and came in 12-foot strips for single-lane construction. Each joint was pierced by eight dowels which were greased on one side to slide in special sleeves. They were capped with a 1¼-inch steel channel. Each contraction joint is a steel

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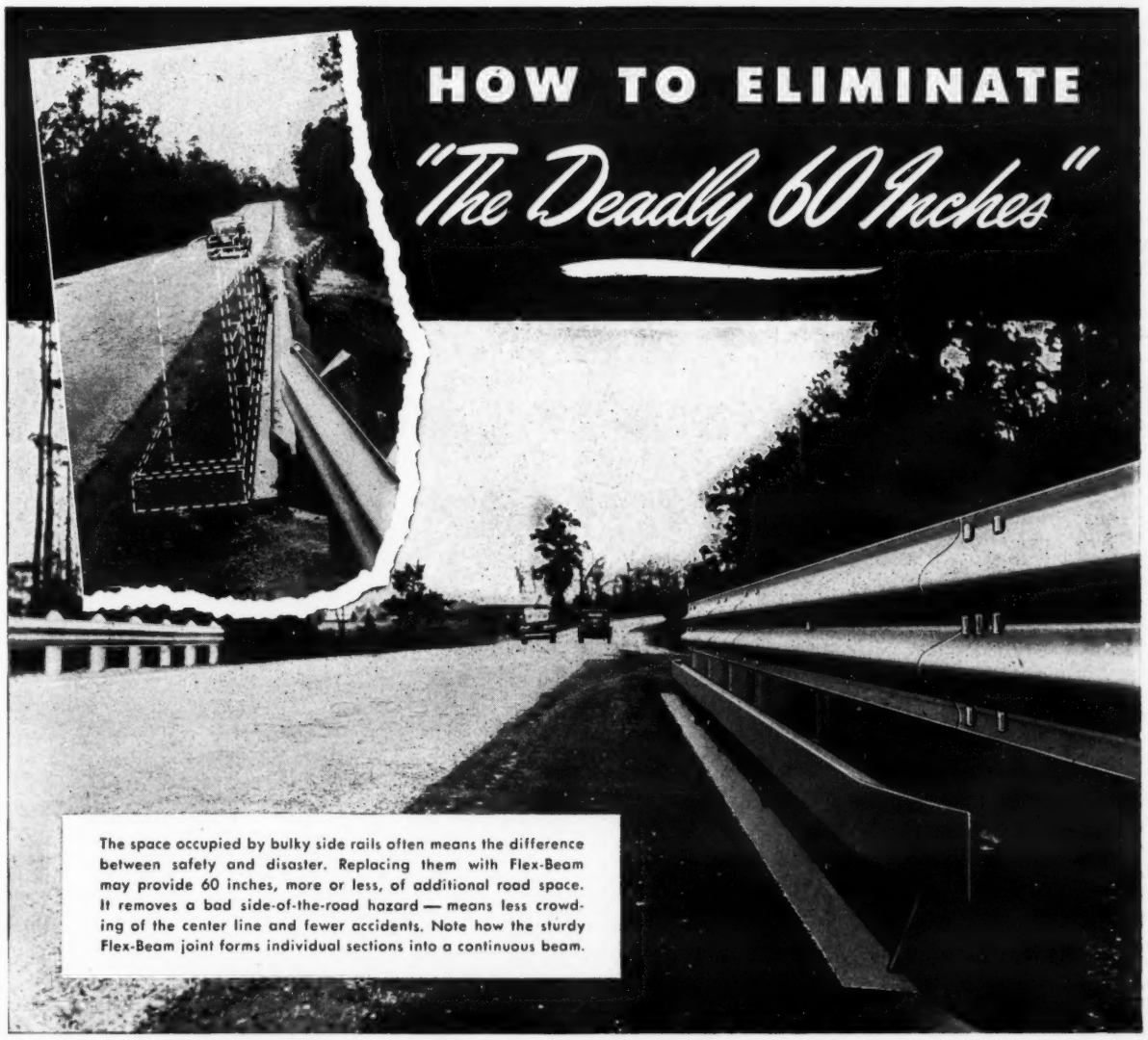

The space occupied by bulky side rails often means the difference between safety and disaster. Replacing them with Flex-Beam may provide 60 inches, more or less, of additional road space. It removes a bad side-of-the-road hazard — means less crowding of the center line and fewer accidents. Note how the sturdy Flex-Beam joint forms individual sections into a continuous beam.

When narrow bridges squeeze traffic you can "let out the seams" by replacing bulky railings with Flex-Beam Guardrail. It is equally practicable for new construction. And by making the rail continuous through the bridge and beyond the ends you have an efficient, economical safety approach.

Providing a wider roadway is only one of Flex-Beam's many advantages. It is easy to install and can readily be adapted to any type of bridge construction. Unskilled labor does the work quickly with simple tools. Any type of posts may be used and "deadmen" or other outside supports are not required.

Although light in weight Flex-Beam has designed strength that means uniform resistance to impact at every point. It looks sturdy and *is* sturdy. This plus high visibility—day or night—promotes driver confidence and added safety. The elimination of heavy railings often permits the bridge to carry greater live loads. Painting is easy and little or no other maintenance is needed.

You'll also find Flex-Beam an ideal guard rail for curves, high fills or wherever else it is needed to protect motorists. Write for complete information. Armco Drainage & Metal Products, Inc., and Associated Companies, 1755 Curtis St., Middletown, Ohio. Sheffield Steel Corp., Kansas City, Mo.

Flex-Beam GUARDRAIL

ARMCO

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A complete line for every type of Rock Drill, Pavement Breaker and Clay Digger.

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Highway-Cost Problem, Now and in the Future

Future Reduction in High Costs Will Come From Competition in Industry, Better Methods and Equipment to Build Roads of Improved Design

✦ HIGHWAY costs in the reconversion period and in the days beyond were discussed by H. E. Foreman, Managing Director of the Associated General Contractors of America, at the 37th Annual Meeting of the Mississippi Valley Conference of State Highway Departments.

Although highway costs are higher than they were before the war, this increase is not confined to construction alone, Mr. Foreman pointed out. All phases of American economy have undergone price increases, and the indications are that prices of most commodities will remain higher than in pre-war days for an indefinite period.

If general costs are higher, and are to remain higher than they were before the war, the important question about highway costs "will be whether or not they are reasonable, in line with other goods and commodities, and productive of sound values for the investment in highway construction," he asserted.

State highway officials, the Public Roads Administration, and the general public will have to become adjusted to higher highway costs, due to the general rise in expenditures, Mr. Foreman stated. He emphasized, however, that the strongest force for the reduction of highway costs will be the future competition within the construction industry for more efficient methods of producing highways of constantly improved design.

State highway officials and highway contractors have both separate and mutual interests in the cost problem. The former face two major issues: first, fewer miles of roads can be built today with the same funds as before the war; second, this increased per-mile cost must be justified to the state legislature and to the public which pays the bills.

Highway contractors do not escape these problems fully, however. They too must justify to the public the cost per mile which they charge the highway department. And they know that no business can survive long if its prices are not just and equitable, and so recognized by its clients and the public.

More and better highways is the aim of both the highway official and the highway builder. Both want the public to receive the greatest possible value for its investment. And, asserts Mr. Foreman, through full discussion of their mutual problems, savings can be made to the public.

Present-day uncertainties make it impossible to forecast prices with any degree of certainty. Wage rates, the availability and efficiency of labor, material prices, delivery dates of materials, and other problems plague the contractor who has been asked to submit a bid which must guarantee the completion of a project at a special price and time.

How long these conditions will last is anyone's guess. But, so long as they do, the prudent contractor who intends to stay in business must protect himself with contingency items against those unpredictable increases that could throw him into bankruptcy.

Elements of Highway Costs

For the contractor, highway costs are composed of two kinds of elements. These cannot be defined in any clear-cut manner, except as those within his control, and those beyond it.

Within the control of the contractor are such cost elements as the selection of the method, personnel, and equipment for performing the work, and the energy to be exerted in carrying out his operations. He exerts little or no control over such elements as the design of the project, specifications for quality and workmanship, type of materials to be used, width of road, depth of pavement, straightness of alignment, and reduction of grades, etc.

Moreover, there are many elements of costs that stem from wartime restrictions still in force, taxation, labor laws, regulations, and requirements over which the contractor has almost no control. Laws, Government regulations, and the refinement of specifications are as real elements of cost as payrolls and materials, and must be fully understood when evaluating future highway costs.

In the national trend towards higher wages and salaries, it is inevitable that highway wages should be influenced. During the war, highway wages increased partly because other wages did, and partly because contractors had to pay more to secure men. However, the average hourly-rate increase during the

(Continued on next page, Col. 4)

Grading and Paving On Road Relocation

(Continued from preceding page)

plate, 1/16 x 8¾ inches, also pierced by eight dowels which actually are steel angles, 1¾ x 1¾ x 9 inches long. As a tie between lanes, steel dowels were placed on 5-foot centers. Mesh reinforcing was also placed in the slab 2 inches below the surface. The shoulders on each side of the dual highway vary in width from 4 to 8 feet.

Items and Personnel

The major items in this 2¼-mile dual-highway contract, which was awarded in January, 1944, to Booth & Flinn Co. for $1,252,499, included:

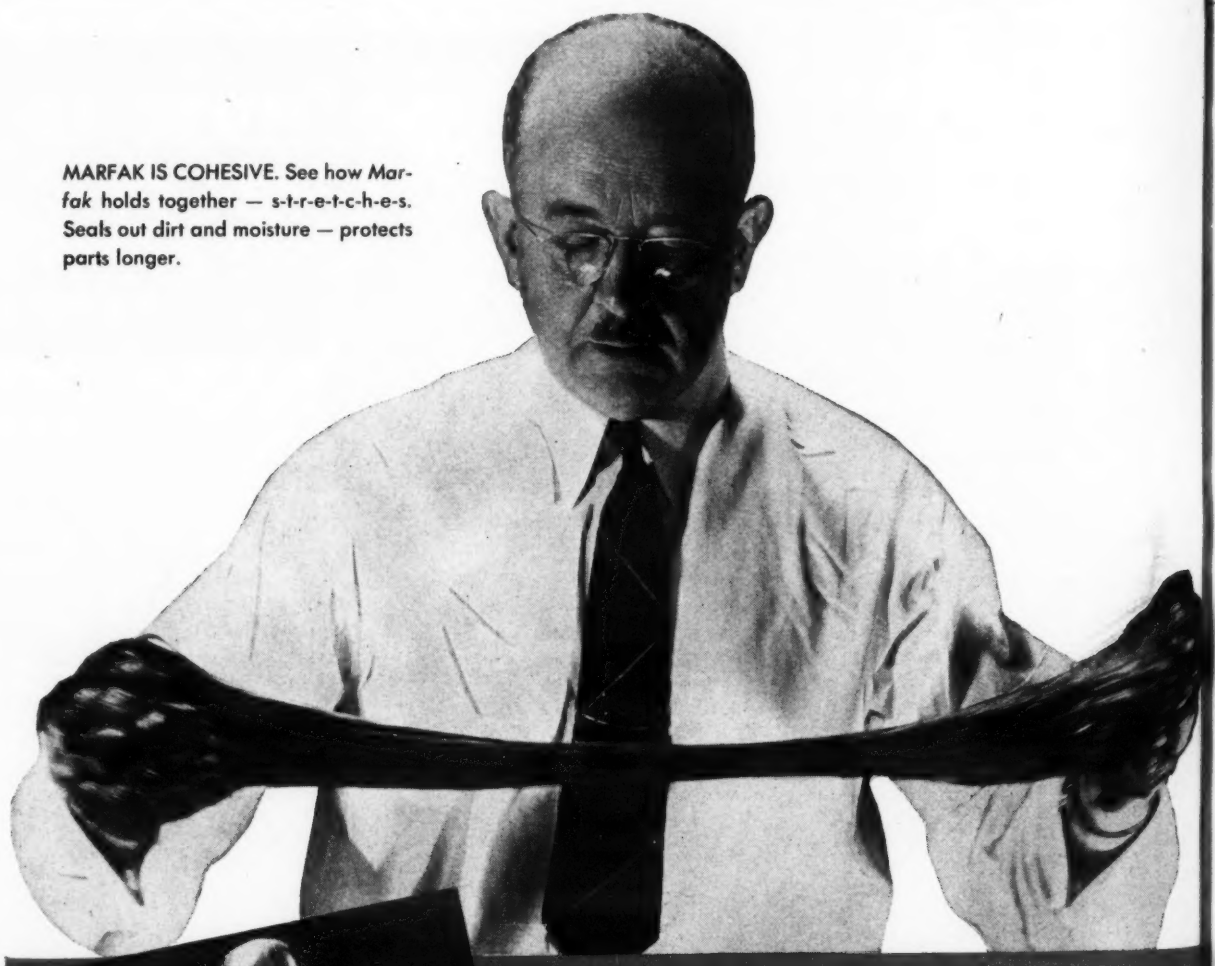
Excavation	190,398 cu. yds.
Reinforced-concrete pavement, 9-inch	64,777 sq. yds.
Steel reinforcing	82,350 lbs.
Concrete pipe, 12 to 24-inch	8,146 lin. ft.
Tile underdrain, 6-inch	8,401 lin. ft.

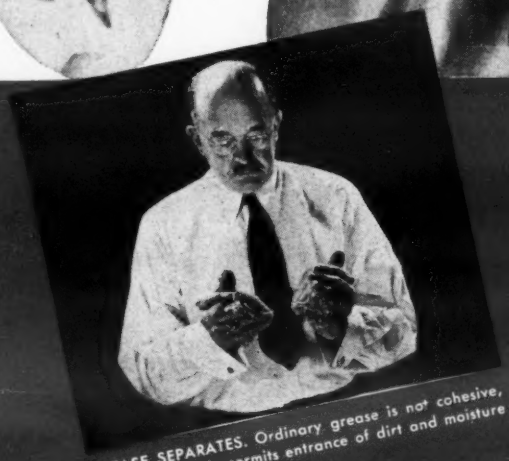
Directing the construction activities of Booth & Flinn Co. was Superintendent L. von Berg, while the Pennsylvania Department of Highways was represented by Engineers D. B. Boyers and S. E. Michael. The project is located in District 11-0, comprising Beaver, Allegheny, and Westmoreland Counties, which is headed by E. L. Schmidt, District Engineer, with John S. Yard as Assistant District Engineer of Construction.

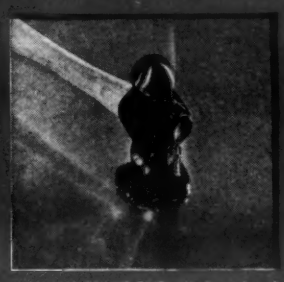
New Evans Appointments

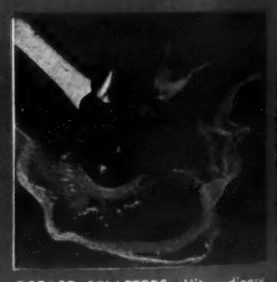
Various sales appointments for its Thermo-Aire Division have been announced by the Evans Products Co., Detroit. E. J. Sanders has been named Western Manager, with offices in Los Angeles. He will be assisted by William A. Lippman, formerly with the Sky Products Division.

Frank A. Chase is the new Central Sales Manager for the Division. He maintains offices in Cleveland. In the eastern territory, with headquarters at Cranford, N. J., Frank Dolinich has been appointed as aide to J. J. Brandon, Eastern Sales Manager.




GREASE SEPARATES. Ordinary grease is not cohesive, has no stretch. It permits entrance of dirt and moisture — fails to protect parts.


MARFAK STAYS PUT. Hit it as hard as you can, Marfak cushions the blow, doesn't splatter — stays in the chassis bearings.


GREASE SPLATTERS. Hit ordinary chassis lubricant and it flies in all directions — leaving parts unprotected.

TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT STARRING JAMES MELTON WITH HIS GUEST, ED WYNN — CBS

TEXACO REG. T. M.

TEXACO

Tractor-Excavator Handles Cubic Yard

A new tractor shovel, the Traxcavator Model IT4, has been announced by the Trackson Co. The machine is built for mounting on track-type Caterpillar D4 tractors. Suitable for many general uses, it comes with a standard 1-cubic-yard bucket. A bulldozer blade, angle-grader, and other attachments are also available.

Built with modern design, the excavator and tractor are engineered to serve as a unit and to match each other's full capacity. Not only will the IT4 dig and excavate big yardages in tough soils, Trackson says, but it will load trucks, transport all sorts of bulk materials, ditch, carry, spread, strip, bulldoze, backfill, level, landscape, terrace, trench, remove snow, and do a host of other earth-moving and material-handling jobs. The tractor drawbar is free for hauling at all times.

The IT4 has a mechanical hoist said to be fast, positive, and dependable in all circumstances. This hoist is driven from the front power take-off of the tractor through a V-belt drive, so it is independent of the tractor clutch and transmission. The bucket can be dumped from any point on the 9-foot lift, and has a digging range from 14 inches below the track line to 56 inches above. Its 75-inch width makes it wider than the tractor for close trimming of slopes or along walls and curbs.

The new IT4 Traxcavator for mounting on a Caterpillar D4 has a capacity of 1 cubic yard and is adaptable to a wide variety of dirt-moving and materials-handling jobs.

A bulletin, Form 895, describes the new Traxcavator IT4. It can be obtained, on mention of this notice, from the Trackson Co., Dept. CE-36, Milwaukee 1, Wis.

Dickinson Joins Staff Of Calcium Chloride Assn.

The appointment of William E. Dickinson as a civil engineer on technical service has been announced by the Calcium Chloride Association. A veteran of four years' naval service, Mr. Dickinson has seen duty on the staff of the commander of aircraft carriers in the Atlantic fleet, and he was in charge of ordnance facilities of the Norfolk Naval Air Bases. Before the war he served as Special Assistant to the Chief of the Construction Division, U. S. Engineers, at Wright Field.

IT

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Contractors everywhere find that *Marfak* gives greater protection with fewer applications. *Marfak*-protected machinery stays on the job longer. Fewer repairs and parts replacements are necessary. Maintenance costs are reduced.

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Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

Highway-Cost Problem, Now and in the Future

(*Continued from preceding page*)

war was less in construction than the average for other war-production industries. Credit for this goes to the Wage Adjustment Board.

Strong pressure now prevails for increased construction wage rates. The open-shop basis and rural wage rates are being banned by unions, which are becoming better organized. More and more work is being undertaken by union labor. Construction of expressways has given the unions a chance to project higher wage scales into rural territories.

In the past, state highway departments and chapters of the Associated General Contractors have worked closely in arriving at the wage rates to be determined by the department, or approved by the Federal government. Future consultations between the contractors, Government officials, and representatives of labor will become increasingly necessary in the development of sound wage rates.

Materials and Equipment

Most contractors today are faced with the difficulty that prices for materials are not established until deliveries are made. Even more costly to the contractor is the uncertainty as to time of delivery, which makes the scheduling of operations on an efficient basis almost impossible.

While goods are scarce, competition for their sale does not exist. Until competition returns, the contractor cannot exercise fully one of his principal functions of being an economical purchasing agent. This, plus the fact that material costs will go up because of increasing wage rates, will give the contractor a headache for some time to come.

Surveys of the state of contractors' equipment show that while most operators are able to handle the expected volume of work this year, they plan to replace their equipment by the end of the year. This indicates that the methods to be followed this year will closely parallel those developed in the past. Much of the equipment to be used will be worn and subject to more than the ordinary number of breakdowns.

Future equipment will be more expensive, but it is safe to assume that it will also be more efficient. It will permit the development of better methods with a resultant drop in the cost of operation.

Other Cost Factors

Since before the war taxes on business operations have increased heavily. Increased bookkeeping and paper work have made the contractor's lot a wearying as well as an expensive one. Regulations and more regulations from national agencies right down to the local community make for more and more work in the office, with added indirect costs for the highway as a result.

The constant improvement in the design and quality of highway construction also adds to the cost. Greater care is now taken in compacting the subsoil, pavements are thicker and of better quality, the right-of-ways are wider, alignments are straighter, grades are smoothed out with more cuts and fills, more structures reduce traffic hazards —all these features improve the modern highways.

These factors increase the per-mile cost of a highway. The result, however, is a highway which is probably less expensive to maintain, is safer for travel, and on which traffic is handled more easily and vehicles are operated more economically.

The public should be informed of

(*Concluded on next page*)

Highway-Cost Problem, Now and in the Future

(*Continued from preceding page*)

such improved highway benefits. It is the duty of the highway department to do so. To this end, the Associated General Contractors carries on a public-relations program under the slogan, "America Progresses Through Construction".

What to Do About Highway Costs?

The Joint Cooperative Committee of the American Association of State Highway Officials and the Associated General Contractors of America recently made the following suggestions to help reduce costs:

1. Eliminate as far as possible items of work which require hand labor both in structures and in grading.
2. Design concrete structures so as to permit the use of standard forms, thus saving labor and lumber. Research shows that longer life in reinforced-concrete structures will result from larger-sized members.
3. Use pipe culverts where possible.
4. Study earth compaction, theoretical moisture content, and refinements in material specifications to determine where refinements become more costly than is necessary.
5. Award only such projects as can be finished this year (1946).
6. Study present uncertain conditions with this view in mind: equitable determination of how risks which are beyond the control of the contractor and which lead to increases in cost should be apportioned between the department and the contractor.

Joint study by all members of the industry will aid greatly in working out reduced costs. The prosecution of highway construction presents problems common to all industry, and a united effort must be made to promote more stable conditions. A moderate volume of work will accomplish the objective better than a complete cessation of activity.

The Future

An analysis of trends leads to the conclusion that, in the future, highway costs will level off on what will become a new plateau. Some trends will recede; others will continue upwards. They will tend to neutralize each other.

Labor will gain in political strength and in its effort to secure higher wages, these trends indicate. Material prices will increase with the wage rate. Taxation and Government regulations will raise the cost of running a business. And improved highway design and construction will bring other increases.

Balanced against these increases will be the development of more efficient machinery and methods. How these forces will work together or run counter to each other as highway construction increases in volume, and how they will affect eventual highway costs, is impossible to predict now.

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Portrait in Print

By Ray Day

Initiative and Hard Work Still Key To Success, Says W. W. Clyde of Utah

✦ IT was cold and blustery that day in 1924. The two men had traveled far, in an automobile of early vintage. Upon their sound appraisal of the Nevada country that now lay about them depended, in large measure, the successful opening of many of the present-day highways of the west.

One of the men was tall and wiry, with piercing blue eyes and a weathered face. It was apparent that he was the leader. He pointed a slender, artistic finger across Steptoe Valley toward Silverzone Summit and asked, "What do you think, Jim?"

"I think we could do it," the other responded. "But you know as well as I do that we've not been able to get bonded."

"We haven't tried very hard. We just went to one bank and . . ."

"Yeah, I know. You wanted to see if we *could* make a low bid, first. Well, now, you've seen it. What do we do?"

The wiry man with the manner of a leader said gently, "We do this, Jim. You've got a few more contacts than I have, so you arrange for our bond by tomorrow at sundown."

"What'll *you* do?"

"I'll go in to the State Highway Department at Carson City and lay a low bid on the table." His words were confident.

"All right, but you're out on a limb. What if we go wrong?"

The roadbuilder glanced at his partner with a look half of fond amusement, half of good-natured scorn, and jibed, "Hell, Jim, let's take a chance!"

The man who spoke these prophetic words is W. W. Clyde of Springville, Utah, one of the best known highway builders in the Rocky Mountain territory. "Hell, Jim, let's take a chance!" Mr. Clyde's life has typified those American words.

W. W. Clyde and Jim Sumison landed that job. Their low bid, in the neighborhood of $150,000, won them a slice of construction on U. S. 50 from Silverzone Summit to Pequop Summit near Cobre, Nev. Those were the days of teams and horse-drawn fresnoes; of labor hired by foremen on the job; of 20-hour-a-day supervision. They had cast the die. There was no turning back. On that first job Clyde and Sumison cleared nearly $50,000, and they began a reputation which is so real today, in 1946, that one of the sayings among highway contractors of that territory is "Clyde is the man we've got to outbid".

An Urge to Build

Today Clyde, as President and General Manager of the W. W. Clyde Construction Co., sets the pace for highway construction in the Rocky Mountains. Sometimes it's a pace that kills. He insists that his is not a Horatio Alger story. It is the story of a man who wanted to be a builder; who first put his dream on a solid educational foundation, and then built a superstructure out of experience, accomplishment, and concern for the good of his native west.

He attacks his work today, at the age of 56, with the same energy and drive of 20 years ago, to the constant amazement of younger men around him. Years of being the master of his own destiny have made his decisions lightning-fast and sound. The man is so typically western that he works as hard at recreation as he does on a highway job. In recent years he has had to reduce the frequency of his trout-fishing and deer-hunting expeditions, because he was wearing out the younger associates who accompanied him!

This driving urge has conditioned in Clyde a philosophy of character upon which he is ready, willing, and able to expound in the most articulate fashion. He is certainly no exception to the well known truth that most of the sons of Utah pioneers can express themselves fluently.

"I am not quite convinced that the get-in-and-get-it system we used in 1925 was wrong," he reminisced with a smile. "Sure, we worked hard. Sometimes we didn't get home to our families for weeks. Sometimes we were fat; sometimes we starved. We needed whipping sometimes, but we never needed coddling.

"There's always a world of personal satisfaction in making one's own breaks," he said. "I believe that a man sacrifices his freedom if he lets the other fellow take care of his 'security'."

Security in the construction business was something Clyde had to learn the hard way. With their first job finished to everyone's satisfaction, and the profits safely tucked away, Clyde and

(*Continued on next page*)

W. W. Clyde, President and General Manager of the W. W. Clyde Construction Co., Springville, Utah.

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Initiative, Hard Work Still Key to Success

(*Continued from preceding page*)

Sumison were in pretty much the frame of mind of men who exclaim, when they discover what appears to be a sure thing, "Say, this is all right! How long has *this* been going on?"

A new road job was up for construction between Myton and Duchesne, Utah. It was in a bad section, and it looked tough. Clyde pounced on it. Earth work, all done by mule-drawn fresnoes, consisted of saturated clay-gumbo subsoil with boulders on top. Clyde sharpened his estimating pencil, balanced this scheme against that scheme, and finally chunked in a bid which he hoped would be low. It was. It was so low that when the bids were opened and read, Clyde found to his dismay that he had left thousands of dollars "on the table". The difference between his low bid and the next highest amounted to a sum he sorely needed.

His men tackled the job, which would be hard to move today. In 1946 Clyde can talk about that job, but he does so with a wry smile. He had gained some worldly knowledge, at the cost of some personal disillusion.

Clyde said, "We dug into those cut sections expecting to find the boulders hard to move, but they weren't nearly as bad as the saturated clay-gumbo. The wet clay stuck to the sides of our equipment, and the loads were impossible to dump clean. The clay and rock balled up in the worst mess you ever saw.

"We'd have to stop and clean the fresnoes by hand about every three trips. This was expensive, and of course we hadn't figured much for this item. When we finished that road, smack up against our time limit, we had a highway, lots of experience, and little else.

"It was a sizable job, but Jim Sumison and I made only $1,500 apiece for ourselves in 1925 by working harder than we ever did before or since. And we were lucky to get out that well."

After that experience, Clyde realized the value of close estimating. He branched off into many phases of earth moving, and was responsible for the erection of fills and embankments for the Union Pacific, and Denver & Rio Grande, and other western railroads.

By the early 1930's, Clyde was firmly established as a construction fixture in the west. The old partnership with Jim Sumison was dissolved, and Clyde's two younger brothers, Harry and Edward, were helping to carry the managerial load.

Headed, with his fellow Americans, for the worst depression this nation had ever undergone, Clyde guided his construction business expertly and confidently. To him it must have seemed that his boyhood dream of becoming a successful builder and engineer was close to realization.

Clyde's Early Days

Born in Springville in 1889, Clyde had seen much of the growth of his native Utah. The ordinary desire of young boys to be cowhands never occurred to him, for he had already learned to ride, rope a steer, and shoot with deadly accuracy. Although he was fast on his way to becoming an expert at ranching, the one thing which turned his destiny in other directions was the sight of numerous survey parties working on the Union Pacific right-of-way near his home. As he went through Springville High School, the sight of a surveying transit became the grail for his youthful thoughts to follow, a design for the future.

In 1909 he entered the University of Utah at Salt Lake City. During the next 4 years he absorbed the technical education which today is the solid foundation upon which his record of accomplishment rests. Upon Utah's magnificent mile-high campus shaded by lofty trees, he practiced some of the theory which he has since carefully sifted; some for use, and some to be discarded. Instructors there, like Dr. Richard R. Lyman and Professor Katchum, formed the nucleus of his acquaintanceship in the civil-engineering field. In 1913 he graduated with the degree of Bachelor of Science in Civil Engineering.

Even then, as a young embryo engineer, he did not drift aimlessly but followed a carefully charted course. He took a job on a survey party for the U. S. Department of Lands, on the utterly sound idea that even an engineer is not worth his salt until he has demonstrated his ability to earn it. After gaining some experience as a surveyor, Clyde moved up to the more lucrative and responsible job of Mining and Electrical Engineer for the Spring Canyon Coal Co., a job he held for 8 years.

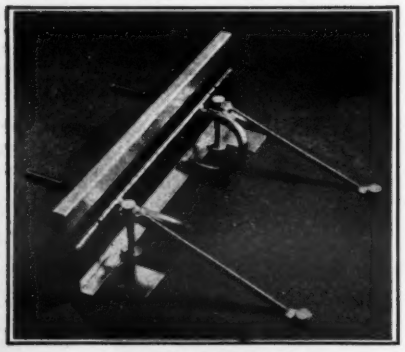
As his knowledge of engineering grew, so did Clyde's determination to be a successful contractor. Hard work and a careful, systematic method of saving found him, at the age of 35, ready to launch upon his first marginal venture. Everything he owned, including the security of his wife and children, went into that initial undertaking. What thoughts must have passed through his mind, that day near Cobre, when he had to say, "Hell, Jim, let's take a chance!"

And that was not the only tough decision he has had to face. In the

(*Continued on next page, Col. 4*)

Well Anchored Joints For Concrete Paving

Tested and Proved for the past 10 years



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The DOW-WELD joint is delivered in the form of a rigid welded truss unit and is permanently anchored to the subgrade, thus insuring a true alignment of the dowels. Due to the staking device it is not necessary to disturb the concrete.

This joint has been extensively used for the past ten years on major highway and airport projects, and the results have been tested and proven to be satisfactory.

We shall be glad to furnish the location of such projects upon request.

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THE TRUTH ABOUT

UNTIL now, you've heard about Aquella from everybody but us. First...there was Kurt Steel's absorbing article ("Dry Cellars") in the December 15, 1945 issue of Forbes Magazine.

Second...there was the condensation of this same article which appeared under the caption "Water Stay Away from My Wall" in the January issue of the Reader's Digest.

Third...there was a flood of anonymous letters containing garbled references to a Federal Trade Commission complaint, as well as a copy of a letter dated December 29th, 1945, which purported to have come from the Director of the United States Bureau of Standards.

Why you've not heard from us until now...

In the first place, we were far too busy getting out production to meet the nationwide demand for Aquella. Thousands wanted to be Aquella distributors. Thousands wanted to be Aquella dealers and contractors. And many, many thousands more wanted to buy Aquella for homes, institutions, and factories. Aquella had captured the public's imagination overnight.

Furthermore, at first we thought that this anonymous attack was just the work of some small, misguided competitor. Then, when the vast extent of the campaign became apparent, we conducted an investigation into the source and motives behind the attack.

The complete details and documentary evidence are to be found in our brochure "The Truth About Aquella."

The Bureau of Standards never intended to discredit Aquella

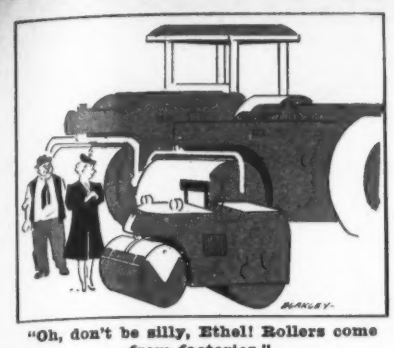
On December 29, 1945, an unsigned letter came from the office of the United States Bureau of Standards written to Forbes Magazine and the Reader's Digest, protesting the publication of Mr. Steel's article.

After the Director of the Bureau was informed this letter was being reproduced and circulated by the hundreds of thousands for the purpose of disparaging Aquella, the Bureau refused to permit further public distribution of copies.

What the Bureau then did was to write *other letters* stating that the communication of December 29, 1945 was not intended to discredit Aquella.

Nevertheless, thousands of copies of that early letter still continued to be circulated through "mysterious sources."

The complete details and documentary evidence are to be found in our brochure "The Truth About Aquella."



"Oh, don't be silly, Ethel! Rollers come from factories."

Pneumatic Tire's Role In Truck Transportation

The part played by the pneumatic tire in the development of commercial truck transport has been noted by the Goodyear Tire & Rubber Co. in a release commemorating the automotive industry's Golden Jubilee. The firm built the first air-filled truck tire in 1916, just 20 years after the birth of the automobile.

Until 1917 all trucks rode on solid rubber tires. This restricted operations to drayage and deliveries within cities. Truck speeds were slow and their maintenance costs high. Goodyear's innovation promised to overcome these drawbacks and extend the horizons for trucking.

To convince skeptics of the value of the air-filled tire, Goodyear undertook the building of special trucks and buses. Then in the early spring of 1917, the firm sent a truck on a day-and-night trip from Akron to Boston. A passenger car accompanied it as a kind of pathfinder. Mounted on 44 x 10 pneumatic tires, the truck had a potential speed of 40 mph.

It took three weeks to cross the mountains to Lancaster, Pa. Mud and more mud, rickety bridges, and finally the complete failure of the engine—a new one had to be brought from Detroit—kept the caravan at a snail's pace. On the level ground beyond Lancaster the truck was able to approach its top speed, but then the tires began to "pop". All told, 23 tires had been used by the time the safari reached Boston, five weeks after it began.

But the trip proved its worth. Goodyear used its observations in correcting new tires, and by the end of summer, trucks were making the round trip to Boston in one week. Pneumatic tires had made nation-wide truck transportation a reality.

New Contracting Firm

The formation of Kean-Wise, Inc., a new contracting firm in the heavy-construction field, has been announced by Edward Kean and Martin W. Wise. The company will maintain offices and yard at Valencia, Pa.

Mr. Kean was a contractor before accepting a commission with the Seabees in 1942. He served in the Pacific with the 53rd Naval Construction Battalion. Mr. Wise was formerly Vice President and General Superintendent of the Harrison Construction Co., Pittsburgh.

AQUELLA...

The Controversy over "Waterproofing" before the Federal Trade Commission

For sometime back there has been a controversy between the Federal Trade Commission and the waterproofing-industry-at-large concerning the use of the word "waterproof" in advertising. What it boils down to is a definition of the word "waterproof" and not any misstatement of fact. Members of the Commission have their definition; those in the waterproofing industry have theirs. The maker of Aquella was only one of many firms that were cited on the issue.

This issue was raised almost a year ago and a complete answer was promptly filed. No further action was taken.

In the meantime, however, there emanated from the same "mysterious sources," thousands of notices of the Commission's citation—with the dateline conspicuously omitted.

The complete details and documentary evidence are to be found in our brochure "The Truth About Aquella."

Now about AQUELLA itself!

From the time it proved itself on the French Maginot Line, Aquella has demonstrated its effectiveness against moisture and seepage in thousands of instances, in various types of masonry construction. There is no single instance where Aquella has ever failed *when properly applied!*

Further, we are continuing permeability tests under hydrostatic pressures which far exceed any that were ever used on Aquella by the Bureau of Standards.

Complete Documentary Evidence for you!

We have prepared a fully documented brochure which contains the complete story of Aquella.

If you are in the waterproofing industry...if you sell waterproofing...if you are counseling customers or clients on waterproofing...or if you are a buyer of waterproofing materials, you owe it to yourself to know the truth!

A copy of this brochure is yours for the asking. Simply write us on your letterhead.

PRIMA PRODUCTS, INC.

NATIONAL DISTRIBUTORS

Dept. X, 10 East 40th Street, New York 16, New York

Initiative, Hard Work Still Key to Success

(Continued from preceding page)

middle 1930's Clyde watched construction volumes decline and construction unit prices hurtle to rock bottom as contractors desperately whittled every possible item off their costs. Clyde was the pace setter then as he is today, but one hard fact confronted him. There simply wasn't enough work to keep his forces busy. It seemed that at last Clyde had reached his limit. All the Springville contractors watched and waited for new work. Clyde watched and studied schemes to lower contract costs.

"If people could only understand how much more value they get out of their construction dollar, in work performed, when costs are low!" he said.

Pioneered With Dirt-Movers

In the west, a then-obscure California contractor named R. G. LeTourneau had developed a tractor-drawn wagon called a Carryall. It would pick up a load of earth, haul it from the excavation point to the place of use, dump it without hand labor, and return for another load. Here, perhaps, was what the construction industry needed. Here, perhaps, was a machine capable of lowering earth-handling costs so that more jobs could be done with the limited amount of money then available. LeTourneau was in the business to sell these units, not to underwrite their use, so once again W. W. Clyde was faced with a hard decision: should he go off the deep end for the public good, or should he stay with tried and true conventional methods and take what jobs he could?

"Request six Carryall units first available transportation," read his order.

When he was asked about that decision, Clyde said, "In my opinion, the development of tractor-drawn dirt-moving equipment is the most significant, the most important introduction of machinery in this Machine Age for the betterment of our national highways. Power shovels, draglines, bucket loaders . . . all are important, but the fast tractor equipment of the past 10 years has revolutionized the dirt-moving business for several decades."

Once again Clyde hit his luck right. The Carryalls proved their worth. Clyde was in on the ground floor, and he slashed dirt-moving costs lower than anyone had ever dreamed possible, still at a fair profit to himself. Horse-drawn fresnoes slipped into that limbo of forgotten things, and Clyde watched other contractors adopt the new machines to meet the competition he had provided.

His list of projects for the public good grew. His Carryalls had finished the 37-mile link between Kemmerer and Evanston, Wyo., far ahead of schedule. A Clyde-built road went in east of Rock Springs, Wyo. His forces constructed the scenic drive on the rim of Bryce Canyon, Utah, for the National Park Service. The Zion Canyon Road, a stretch of Expressway from Salt Lake City to Kimball Junction, the Scofield Dam, airports at Delta, Ogden, and Logan all followed in glittering order. When the holocaust of war engulfed the nation, W. W. Clyde was there with the machines, the workmen, and the experience to implement his low-cost bids on necessary government construction.

The Ranch—His Hobby

He still does all of his own estimating, and usually places the bids. He still does quite a bit of visiting of projects, just to see that things are working smoothly, or to give advice or a word

(Concluded on next page)

Initiative, Hard Work Still Key to Success

(*Continued from preceding page*)

of encouragement to a superintendent who needs it. But any trip he makes to his construction jobs these days is a distinct encroachment on his ranch life, for Clyde has gotten back to the good earth as most people do who lived on the land in their youth.

Aside from his wife and his three sons and three daughters, his ranch at Springville is the most important thing in his life. Part of it he devotes to fruit farming, and he raises some of the choicest apples, peaches, and cherries in the community. The remainder of the ranch produces white-faced Hereford beef cattle. Clyde is never so happy as he is on those long, languid days when things are going right and he can drive to his ranch and wear everyone out in a whirlwind of fence repairing, stock watering, tree pruning, and other strenuous activity. He reads a great deal, but you never see him doing it. The results show when he addresses a gathering, or presides at a construction meeting, as he did recently at the University of Utah Highway Conference. Any time you see him he is likely to have a fresh coat of sunburn, a new construction job in the offing, and a whole host of urgent problems, all of which he thinks should have been disposed of yesterday or the day before.

More Work Means Lower Costs

"What's the most important question mark in the construction business today?", he repeated my $64 question. "Why, it's labor, of course."

I asked him to go into a little greater detail on this subject of which we hear so much, so little of it coherent, these days. He graciously obliged in words which show a keen insight into the troubled picture today.

"If we're to keep our construction costs down, we've got to keep on working all the time, every day, every week, every year. I don't mean that we ought to abolish strikes, or that labor should work for starvation wages. I do mean that we all—each one of us, labor and management alike—should seek to get more out of our daily life by giving a little more to it.

"One of my motor-grader operators, for example, could help to lower costs by turning in just a little more finished subgrade. If he lowered his part of our costs, and we all reciprocated in turn, an earned dollar would go farther. It would furnish other employment by its purchasing power of more commodities. In our case, lower costs would mean more miles of highways.

"Government help? Subsidies?" Mr. Clyde will look through you and beyond as he says, "My friend, the Government can give you only what it has taken from you.

"But there is no monopoly on self-improvement. There is no law which prevents a man from helping himself. There are no governmental regulations to follow when a man decides to fight his own battle, without outside help. And what a reward in satisfaction!"

"Do you believe that this return to 100 per cent efficiency, if it can be brought about, will help labor to develop America's greatness still further?" I asked.

"*Help to develop?*" he snorted. "Why man, *that is America's greatness!*"

New Ceco Houston Staff

Ralph K. Alexander has been named to succeed Russell L. Jolley as Texas Manager for the Ceco Steel Products Corp. He was District Sales Manager at Oklahoma City until recently, and has been with Ceco since 1930. Assigned to assist Mr. Alexander is William A. Smith, formerly Assistant Manager in Washington, D. C.

Ceco has purchased 8 acres of land in Houston for the erection of a plant for fabricating steel forms, joists, and reinforcing bars. Until this plant, to be located on the MKT railroad, adjacent to White Oak Bayou, is completed, the present Ceco factory at 2814 Pease Avenue will continue to operate in the Houston territory.

Kentucky to Resurface Extensive Road System

Kentucky began bid-letting for nearly 500 miles of resurfacing projects on May 17. Part of the year's maintenance program, the projects will affect 40 counties, and will cost an estimated $1,000,000. To promote economy for both the state and the contractor, the work is being allocated in groups. In other words, one bid will cover a number of projects. This action will reduce the necessary movement of machinery, supplies, and equipment, Commissioner of Highways J. Stephen Watkins announced.

These are the first in a series of maintenance projects calling for bituminous resurfacing. The entire program for the year is expected to cost in the neighborhood of $3,000,000.

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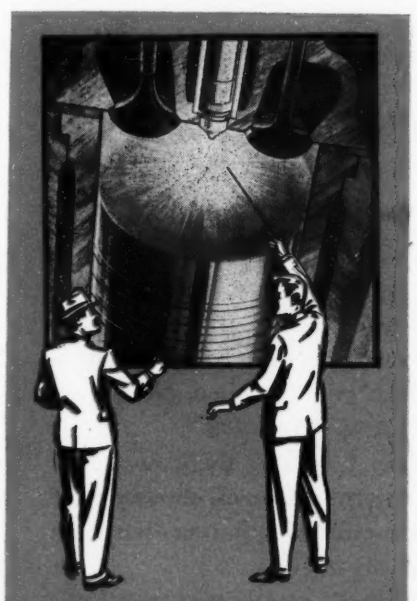
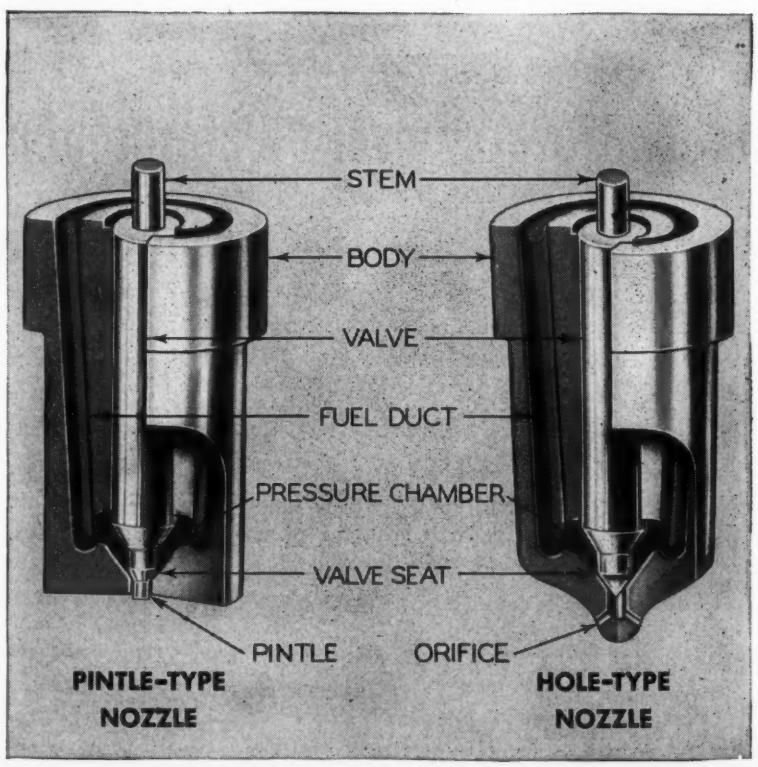
places easier . . . takes less time and labor
DEWEY AND ALMY CHEMICAL COMPANY, CAMBRIDGE 40, MASS.

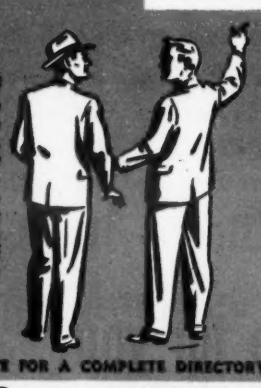
GOOD FUEL INJECTION
Requires a Tailored Spray

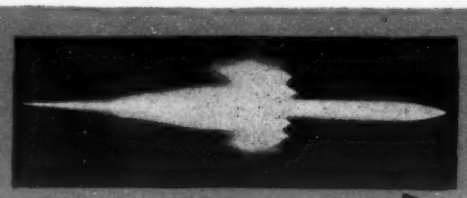


THE MAIN FUNCTION of an injection system is to deliver fuel to the engine cylinders in such a manner that it will burn efficiently. That's why the injection nozzle is so important. It must produce a spray that meets exactly the combustion-chamber requirements.



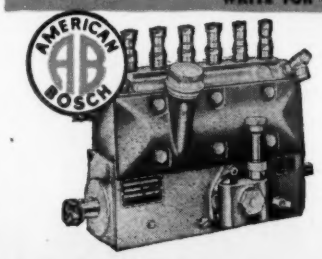
Tailoring is the art of producing the precise spray characteristic which the engine likes best. Tailoring know-how comes from long experience in correlating the selection of every part of the injection system for the single purpose of providing the engine with the ideal spray pattern.





THE CORRECT PATTERN PAYS ITS WAY. American Bosch Injection Equipment provides tailored fuel sprays to fit your Diesel's combustion chamber. That means fuel economy, power to suit the task at hand, and satisfactory performance under all operating conditions.

WRITE FOR A COMPLETE DIRECTORY OF AMERICAN BOSCH AUTHORIZED SERVICE STATIONS



AMERICAN BOSCH CORPORATION, SPRINGFIELD 7, MASS.

AMERICAN BOSCH
Diesel Fuel Injection

The new Parmanco horizontal drill, with complete mechanical feed and traction drive, has a drilling speed of 2 to 3 feet per minute and a 24 fpm retrieving speed.

New Horizontal Drill Has Mechanical Feed

A complete mechanical feed for both drilling and retrieving, and traction drive are features of the 1946 Parmanco horizontal drill. This machine is adapted to all forms of high-wall drilling, and will handle a 6-inch drill up to a distance of 60 feet or more, the manufacturer says. Made by the Paris Mfg. Co., the Parmanco has a 2 to 3-fpm drilling speed and a 24-fpm retrieving speed.

A Wisconsin 4-cylinder 25-hp air-cooled motor powers the Parmanco unit through a double V-belt from a power take-off on the crankshaft. In high gear a 12 to 1 reduction gives the auger a 165-rpm speed; while low gear renders 80 rpm in 25 to 1 ratio. The mechanical feed uses only 1½ hp from the drive shaft. Finger-tip automatic control is possible, while a jaw clutch may be engaged to operate the hand feed, if so desired. Mounted on two pneumatic-tired wheels, the drill has jacks on the front end, and is adjustable within a 36-inch range. The unit weighs about 2,800 pounds.

Full details concerning this new Parmanco drill can be secured on mention of this news item. Write the Paris Mfg. Co. at Paris, Ill.

Mack Executive Recalls U. S. Transportation Lore

The Golden Jubilee of the Automotive Industry, now being celebrated, calls forth reminiscences from David C. Fenner, Vice President of Mack-International Truck Corp. Mr. Fenner entered the automotive field in 1896, continuing a family participation in commercial transportation that began in early American colonial days.

When Roger Williams founded Rhode Island early in the 17th century, Captain Arthur Fenner of the Welsh Guards settled there to found the Fenner family. His interest in supplying the settlers with food from England began the family's transportation traditions.

The early 18th century found a Thomas Fenner transporting goods for hire from Providence to New York, via the Post Road. A generation later, William Henry Fenner, a successful manufacturer-merchant, was using horse-drawn vehicles in his business in Providence. The growth of rail transportation found his son, William, Jr., building steam locomotives at the Rhode Island Works in 1870.

Descendant David Fenner greeted the dawn of the automotive age as a student of automobile design and operation at the Providence Y.M.C.A. The same year he served as a mechanic at the first American horseless-carriage race. Two years' study at M.I.T. and the Boston Testing Laboratories gave him a background in metallurgy and the micro structure of alloy steels.

Mr. Fenner spent five years more in the laboratories and shops of Bethlehem, Pa., before he engaged in the manufacture of parts, assemblies, and motor vehicles for commercial purposes in 1903. He worked with Knox at Springfield Mass., and with the Alden Sampson Division of the U. S. Motor Co. in New York before joining Mack at Allentown in 1911.

In the Mack plant, Mr. Fenner found still another Fenner, a Pennsylvanian named Frank, running the stock room. Shortly thereafter, still another unrelated Fenner, Arthur F., joined the organization. The latter, hailed by David C. as the "real merchandising Fenner", is also a Vice President of Mack-International.

Direct Alemite Sales

Charles I. Kraus, former head of Alemite Industrial Sales of the Stewart-Warner Corp., Chicago, Ill., has been appointed Sales Manager for the firm's Alemite Distribution Division. As his Assistant, Mr. Kraus will have Gustave Treffeisen, until recently in charge of automotive and farm equipment and lubricant sales.

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Superior Quality
BLADES
AND CUTTING EDGES

For any make of machine
Motor Graders, Maintainers, Scrapers, Drags, Bulldozers, Backfillers, Wagon Scrapers, Trail Builders, Trail Blazers, Carryalls. Also—

CUTTING EDGES
WEARING BOOTS
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and
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50 years of manufacturing blades has developed for you a special steel, milled through our own rolls and forged at the edges to give that extra wearing quality you need.

All widths lengths, and thicknesses, punched ready to fit your machine.

Consult your internationally recognized Blade Specialists. Write for special bulletins, giving type and name of machines you operate—get set for Blades early.

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Established 1854
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AIR PLUS JAEGER COMPRESSOR

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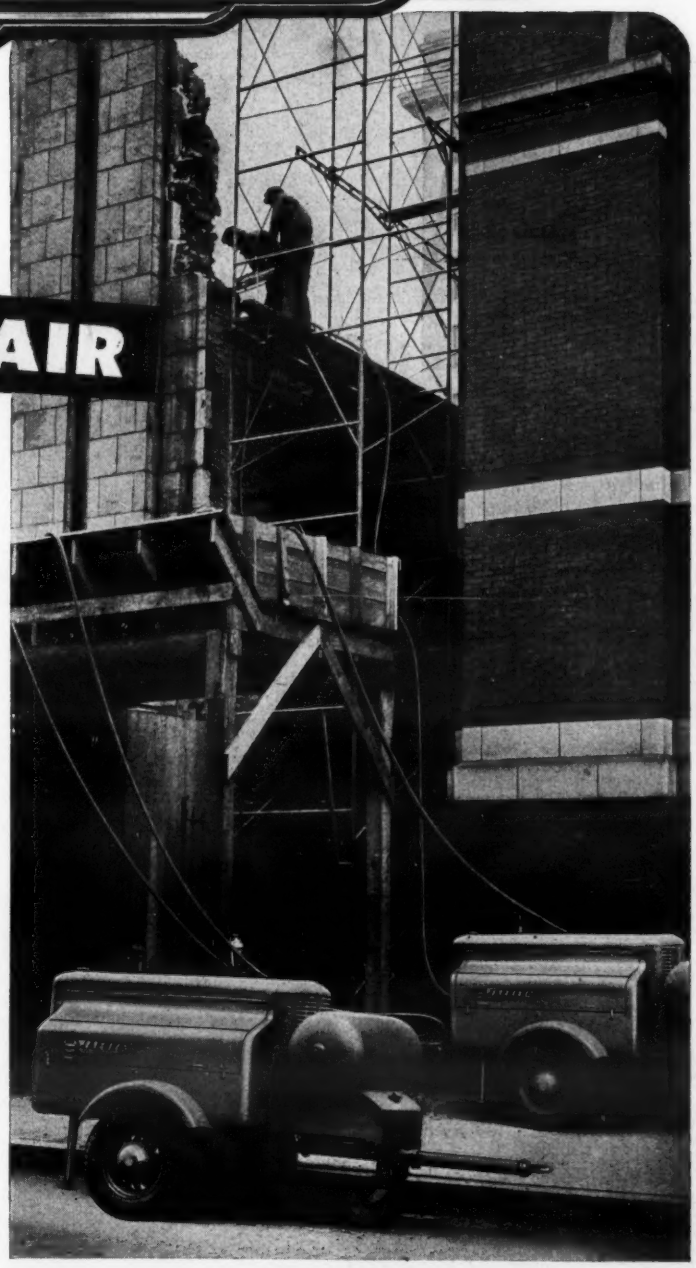
JAEGER AIR



Pre-war dollars never bought compressed air as cheaply as you now produce it with a Jaeger AIR PLUS.

Lower fuel cost: Precision built and balanced, with positively leak-proof valves of twice the usual size and the latest type Continental, International or Caterpillar power, these units deliver full rated capacity of air with less effort and lower fuel consumption than any compressor you have ever operated.

Lower cost of upkeep: Compressor unit and engine are both built to the same standards, with interchangeable parts, force feed lubrication and advanced engineering thruout. Jaeger's "ultra lapped" valves, for example, operate indefinitely without carbon and for 10 times the usual length of life. Clutch, main bearings, truck, frame, etc, are designed for lifetime service on the most rugged work.

Extra years of service — a major saving in replacement cost: In addition to the long-life service of America's finest makes of gasoline or diesel engine, Jaeger gives you a compressor unit that operates at slower piston speeds and cooler temperatures than others and will outlast its original power plant, plus a second, AND A THIRD.

Why buy an obsolete Compressor when you can get a modern, more dependable, more economical Jaeger? Sizes 60 to 500 ft. Sold and serviced in 120 cities. Ask for Catalog JC-5.

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JAEGER Engineered EQUIPMENT
JAEGER-LAKEWOOD SPREADERS, FINISHERS AND BITUMINOUS PAVERS, FORMS, FORM TAMPERS—"DUAL-MIX" TRUCK MIXERS, AGITATORS—JAEGER HOISTING ENGINES, TOWERS

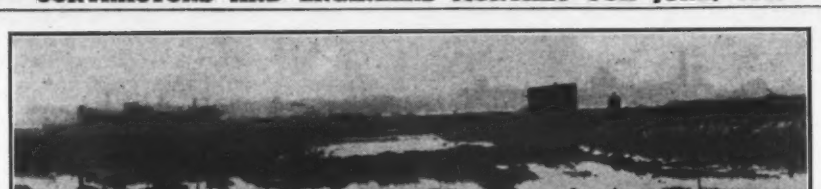
Runway Test Section Built at Big Airport

(*Continued from page* 1)

summer. Its chief feature was that the contractor must supply labor and equipment services as needed when verbally ordered by the engineers directing the work. An estimate of 1,700 man-hours was the principal labor item, while the services of equipment, complete with operators, were for various periods of time and included a large dump truck, small dump truck, power shovel, power dragline, large tractor-dozer, small tractor-dozer, 12-ton 3-wheel roller, disk harrow, and one material item consisting of 18 rolls of Sisalkraft paper. The contract also included an item to cover the cost of transporting each piece of equipment except trucks to and from the job. The time consumed by the trucks going back and forth from the airport was negligible, as compared with that required for similar transit of the slower-moving machinery.

Despite the unusual features of this proposal, New England contractors showed great interest in the work and twelve submitted bids. The award went to B. Perini & Sons of Framingham, Mass., on a low bid of $15,287. As a great amount of base construction and runway-paving work will soon be let at the East Boston Airport, the contractors were all eager to see how the various materials to be used were handled, and what methods and equipment would be best on this type of construction. Hence the large number and close bidding of interested contractors.

To supplement the contractor's equipment, the State supplied a large impressive-looking sheepsfoot roller, purchased from the U. S. Navy surplus-property stores and formerly used in constructing air bases at Bermuda. This roller has triple 54-inch-diameter drums for a total width of 18 feet, and when filled with water weighs 17 tons. By substituting for the water a solution of barium sulphate weighing 150 pounds to the cubic foot, engineers increased the roller weight to over 20 tons. Equipped with 7-inch tamping feet and pulled by a Caterpillar D8 tractor weighing 22 tons, the roller and hauling unit had a total compacting weight of over 42 tons.



Mass. Department of Public Works Photo

For the tests of various materials for runway base course at the Logan Airport in East Boston, Mass., an area where the clay was wettest and slipperiest was selected.

Test Section

To make sure that the materials used were given a really "acid" test, the engineers selected as a site for the test area a place where the clay was softest, wettest, and slipperiest, so that the worst possible conditions would prevail. Only in this way could they determine which materials and methods of compaction would be best for constructing permanent runways. A Lorain dragline with a 1½-yard bucket skimmed from the clay sub-base the top supporting crust which really bears the load, so that the base material had to be built on the soft clay beneath.

The site for this work was approximately 150 feet square, divided into three sections, each 50 feet long. The two end sections were used solely for equipment to turn around in, while the center section was the test area. This test area was divided into five bays, each 20 x 50 feet. There was a 5-foot shoulder on the outside of the area. From this 5 to 1 gravel slopes dropped away from the built-up sections down to the clay line. In each bay on top of the clay was placed a steel settling plate, 30 inches square, with a vertical 1½-inch pipe connected to it. Check levels were taken morning and night on the tops of these pipes to show how, if at all, the clay reacted under the loading and compacting of different strata of materials.

Each of the bays was built up to a preliminary thickness of 42 inches, but with different courses of material. A cross section of the test area shows the first bay to have a 12-inch layer of bank-run gravel on the bottom, and a 30-inch layer of crusher-run gravel on top. The adjoining bay is a solid 42

(Continued on next page)

★ ★ ★

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Runway Test Section Built at Big Airport

(*Continued from preceding page*)

inches of bank-run gravel; the center and fourth bays each has 30 inches of sand on the bottom, with 12 inches of crusher-run and 12 inches of bank-run gravel respectively on top. The fifth bay is divided equally into 21-inch layers with sand on the bottom and bank-run gravel on top. On top of all the bays a course of crushed stone was spread to varying thickness, but with a minimum of 7 inches, to serve as a foundation course for the pavement. The pavement was made up of two courses: a 4½-inch crushed-stone base, bound with sand over some bays and with asphalt over the remainder; and a 2½-inch top course which was given an asphalt penetration treatment and then keyed with small crushed stone. When completed, some of the bays were over 5 feet thick.

The material used in this granular-test area was either purchased by the State or donated by different materials companies which were interested in learning how their products would react under these conditions. It was hauled to the site by the trucks; spread, according to plan, either by the Caterpillar D8 or by an International TD-14 tractor-dozer; and then compacted either by the sheepsfoot or smooth-wheel roller with a varying number of passes. Throughout the course of the work, observations were constantly taken. Data were recorded to determine the static loading and increased-bearing capacity, and to ascertain the best compaction methods. During the winter months the test section was covered with a 2-foot layer of salt-marsh hay to provide protection against frost.

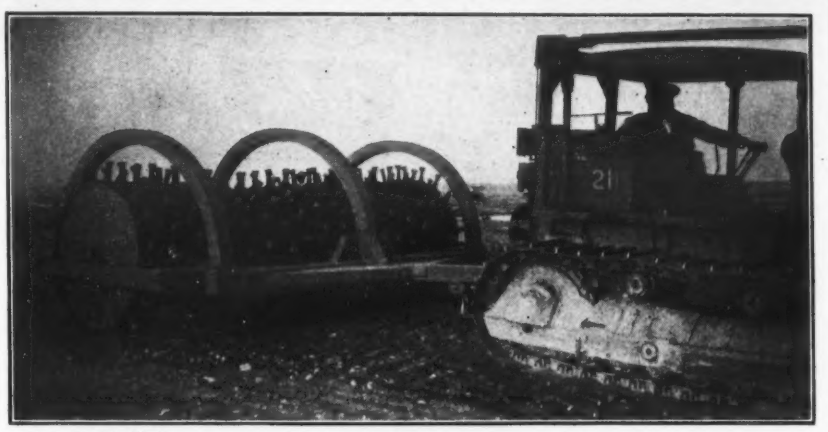
After the pavement was laid, additional periodic static-loading tests were made until the bearing power of the section came to a rest. The results of these tests are now being analyzed and compiled. While no specific conclusions have been announced, two facts became generally obvious during the work itself: (1) by increasing the depth of the granular material the bearing capacity of the section was likewise increased, and (2) this bearing capacity also increases with the passage of time.

Using Available Till

At the southeast end of the airport were two sizable islands rearing themselves above the surrounding waters. These had to be leveled in the interest of safety at the airport. Apple Island, the smaller, had about 500,000 yards of material above runway level, while Governors Island had to give up about 2,500,000 yards in any flattening operation. Actually neither is an island any longer since the hydraulic filling made them part of the airport, so the problem of hauling away the portions above airport level no longer existed at the time of these construction tests. Excavation was still a problem, however, since the material was a clay till that had been baked during the centuries to a considerable degree of hardness.

Whether the clay till could be used at the airport, on runway shoulders or even possibly under taxiways as a base course, was still another question. To answer it, the engineers built another similar test section and began more tests.

The Governors Island till, or GI till as it was called, was excavated by a Lorain 1½-yard shovel, loaded into trucks, and hauled to the test area on the clay hydraulic fill. Six adjoining bays, each 20 x 50 feet, were used, with a turn-around area at each end. The first layer was spread and compacted [illegible] thick. Great care was taken that the material was placed at its optimum-moisture content in order to produce its greatest bearing strength. The moisture content was taken daily both at the bank and at the test area to check any variation. Compaction tests were run on three of the bays, while on the other three the moisture content was carefully analyzed. On top of this initial layer, two additional 6-inch lifts of till were placed, with attention to the moisture content, compaction, and density as before.



C. & E. M. Photo
A triple-drum 20-ton sheepsfoot roller, which had seen service in the construction of Bermuda air bases, was used for compacting base course on the test area at the East Boston Airport.

The static-loading tests were taken on a testing frame, specially designed and built by the Department of Public Works, and capable of transmitting a 75,000-pound load through a hydraulic jack to a flat plate placed on the ground. On this frame weighing 3½ tons two FWD trucks, each with a rear-end loaded weight of 35,000 pounds, were backed, so that the jack moved against a total load of 75,000 pounds. Two extensometers, set up independently of the jack and frame, measured in thousandths of an inch the amount that the plate settled down into the earth. This figure could then be translated into terms of the static-bearing load of the soil at that particular point. The results of these tests are now being analyzed. The Sisalkraft paper was used to cover the test areas of the GI till so that undue fluctuations would not occur in the moisture content.

(*Concluded on next page*)

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Removes Hard Carbon

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USE IT FOR TOUGHEST LUBRICATION JOBS IN ALL INTERNAL COMBUSTION ENGINES

*Accepted by Leading Engine Manufacturers as a Superior Lubricant

Naturalube D.H.D. is basically different — superior to conventional type oils — because Nature itself has given D.H.D. these essential lubricating properties: (1) A naturally tougher film that has unusual ability to *penetrate* to all moving parts plus the ability to *adhere* to these parts even when engines are idle. (2) Natural solvent properties enable Naturalube D.H.D. to loosen and remove hard carbon from rings, pistons, valves and plugs. (3) D.H.D. is naturally non-corrosive—safe!

In addition, Naturalube D.H.D. is specially reinforced to resist the formation of sludge and lacquer which often clog filters, screens and oil lines. When you use D.H.D. you save wear . . . engines are cleaner . . . rings and valves operate freely for longer periods . . . shut-down time is minimized, and maintenance costs are lower. For complete information about D.H.D., see your local Naturalube distributor or write direct to Lion Oil Company, El Dorado, Arkansas.

For normal service where D. H. D. is not required, use Naturalube Motor Oil (not so heavily reinforced.)

POSITIVE MONEY-BACK GUARANTEE

Lion Naturalube Oils are supported by a positive guarantee of satisfaction. If you do not believe Naturalube to be the best oil you have ever used, Lion Oil Company will return your money.

LION PETROLEUM PRODUCTS

LION OIL COMPANY EL DORADO, ARKANSAS

Mass. Department of Public Works Photo
The height of fill from the clay on the test area is checked. All fill was made 42 inches thick, of different courses in the various sections.

Runway Test Section Built at Big Airport

(Continued from preceding page)

Items and Personnel

Work on this contract began on August 14, 1945, but because of the nature of the operations no exact time limit was set. As much as possible, the proceedings were planned to keep the equipment busy for a fairly long period once it had been moved to the site. The average force of the contractor numbered about six and their hours were flexible, for once a test was commenced it was carried on to completion before work was suspended for the day.

The principal items in the contract included:

Service of labor with hand tools	1,700 man-hours
Service of large dump truck with operator	88 days
Service of small dump truck with operator	62 days
Service of power shovel with crew	6 weeks
Service of dragline with crew	1 week
Service of large tractor-dozer with operator	8 weeks
Service of small tractor-dozer with operator	8 weeks
Service of 12-ton 3-wheel roller with operator	3 weeks
Service of disk harrow	30 days

Other Tests

The tests were carried on through the winter when weather permitted and were concluded this spring. The findings will be incorporated in specifications and proposals for future runway base courses at the airport, and will influence the design of pavements for the desired gross plane load.

Besides the tests embodied in this contract, the airport engineers ran levels constantly over the clay fill where the runways are to be laid, getting elevations every 50 feet at the center and each edge of the strip. With these periodic checks the settlement of the fill was closely observed from the time it was first pumped into place. The data were plotted on graphs with the time in days shown horizontally on a log scale, and the settlement on the vertical scale, 1 inch equal to 0.1 foot. From the curves drawn between the points an analysis was made of what was happening. If too rapid settlement was indicated, an investigation was made, borings were sometimes required, and a silt pocket might be disclosed which would have to be removed.

The Massachusetts Department of Public Works was represented on the testing operations by Julius J. Waldman, Resident Engineer, and G. H. Delano, Project Engineer. The Department is headed by Herman A. MacDonald, Commissioner, with R. W. Coburn, Chief Engineer, and Francis T. McAvoy, Construction Engineer. Charles A. Fritz is District Highway Engineer for this area with offices at Beverly.

Heintz in Executive Post

General Sales Manager Charles E. Heintz of the Elastic Stop Nut Corp., Union, N. J., has been elected a Vice President of the firm, in charge of ESNA's sales.

Heads ASD Dredge Sales; Announces New Models

J. C. Tyger, newly appointed Sales Manager for the Dredge and Pump Division of the American Steel Dredge Co., Fort Wayne, Ind., has announced the addition of a new line of 6, 8, and 10-inch suction dredges to the firm's offerings. These models are designed for sand and gravel recovery and small dredging operations. They are built in the same prefabricated style as other ASD dredges. Their bolted sectional-steel design allows the contractor to knock down complete dredges or barges and ship them overland to remote job sites.

Mr. Tyger is former Manager for the midwest district of the Allen-Sherman-Hoff Co. of Philadelphia. He has been active in the dredging and material-flotation industries for many years. His headquarters will be in the newly opened Chicago office of the ASD's Dredge and Pump Division at 134 No. LaSalle St.

What YOU SHOULD KNOW ABOUT

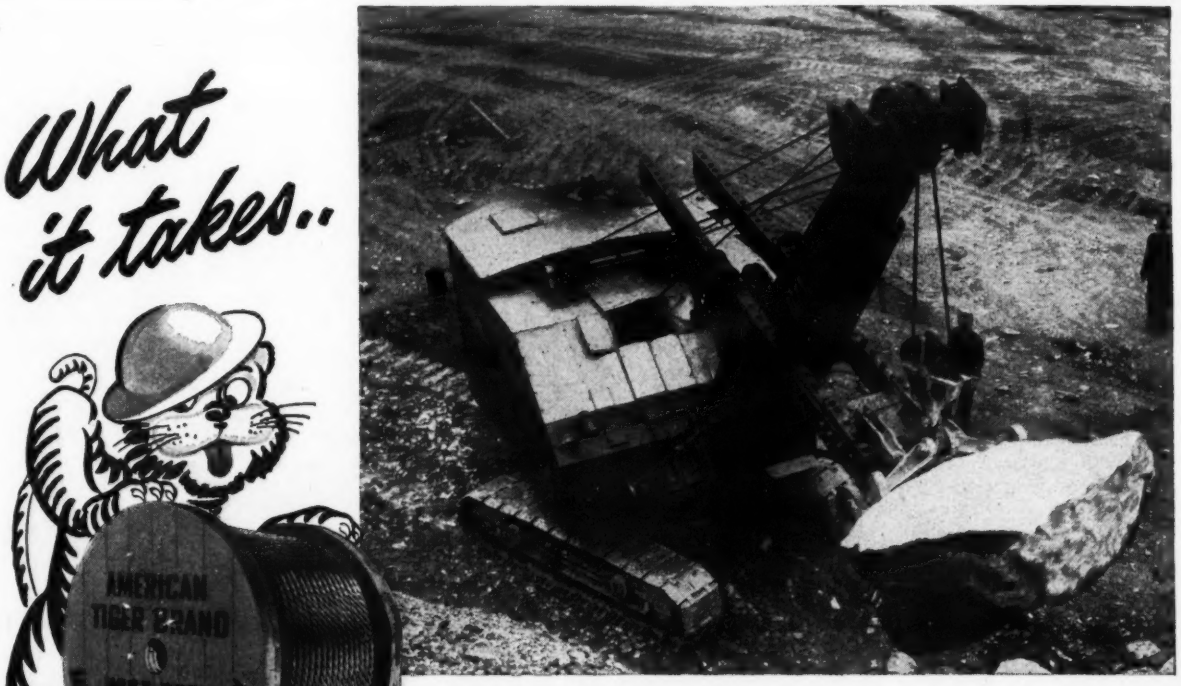
MARKLEY-CARTER Portable DUST COLLECTORS "Collects and Controls"

1 Portable units operate through powerful air stream by an effective double separation principle. No dust escapes into the air. Reduces SILICOSIS hazard to safe hygienic limit.
2 When applied to rock drills, SPEEDS UP DRILLING TO 33 PER CENT. Drill steel cuts into fresh rock unimpeded by dust or chips. PROLONGS LIFE OF DRILL STEEL. REDUCES SHARPENING COSTS.
3 Quick detachable hood permits easy inspection of hole and changing drill steel without interference from hood.
4 When applied as industrial unit, collects dust accumulations that are costly and apt to be a hazard both to men and equipment. Keeps your plant, motors and machinery free from harmful dusts.
5 Equipped with Markley-Carter disposal container which permits continuous collection and disposal without closing down the system.

● Write for Bulletin 4402 which describes in detail the advantages of using MARKLEY-CARTER DUST COLLECTOR in your quarry and plant.

RALPH B. CARTER COMPANY
192 ATLANTIC ST., HACKENSACK, N. J. 53 PARK PL., N. Y. 7, N. Y.

What it takes..



..to Handle Heavy Tonnage

U·S·S American Tiger Brand is as strong, as tough and as tireless as wire rope comes.

Consider, for instance, the experience of the Bonneville Dam contractor who, by using Tiger Brand haulage lines, button lines and hoist lines on his two cableways, delivered two times more tonnage of concrete than the rope previously used. The extraordinary part of this operation was that after these ropes were removed from the cableways and put into service on excavating shovels and draglines, they still gave 75% of the life of ordinary new rope!

You can depend on Tiger Brand to help reduce maintenance and replacement costs . . . to do a more efficient job in every operation requiring wire rope. See your supplier today. He has, or can quickly get, Tiger Brand for you. And if you have any questions our wire rope experts will gladly work with you . . . without obligation.

LISTEN TO . . . the "Hour of Mystery" presented by United States Steel on the radio every Sunday evening. Consult your local newspaper for time and station.

Excellay Preformed

AMERICAN STEEL & WIRE COMPANY
Cleveland · Chicago · New York
COLUMBIA STEEL COMPANY, *San Francisco*
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York
UNITED STATES STEEL

U·S·S AMERICAN
TIGER BRAND Wire Rope

The Moles Hold Election

Alfred N. Warwick, New York contractor, has been chosen President of The Moles, New York organization of tunnel and heavy-construction men. Since 1927, Mr. Warwick has headed the Long Island City firm Eugene F. Warwick, Inc., which was founded by his father and which specializes in industrial-building construction.

Charles B. Spencer, of Spencer, White & Prentis, has been named First Vice President of The Moles; and J. Rich Steers, Jr., of J. Rich Steers, Inc., Second Vice President. E. J. Mahoney of the Mahoney-Clarke Co., is Sergeant-at-Arms; William W. Hanly, Jr., Koppers Co., is Secretary; and Ralph W. Atwater, Shultz Dredging Co., Treasurer.

Arthur A. Johnson, the retiring President of the organization, was installed as Trustee. Other Trustees chosen include: Ray N. Spooner, Allen N. Spooner & Son., Inc.; Eugene F. Moran, Jr., Moran Towing Corp.; Richard V. Hyland, Madigan-Hyland; and Forrest L. Jenkins, Western Concrete Pile Co.

Speedy Excavation Units

Three different sizes of Speedcrane crawler - excavators, Models 3000 - A, 3000-B, and 3500, are described in new literature issued by the Manitowoc Engineering Works. These combination cranes-shovels-draglines are outlined in the booklets by text, photographs, and specification charts. The Model 3500, heaviest of the units, has a 2½-cubic-yard capacity as shovel, dragline, or clamshell, and a 120,000-pound range as a 50-foot crane. Model 3000-B differs from 3000-A in that its power range is 160 to 170 hp, compared to the 140 to 150-hp range of the companion machine. Capacities vary accordingly.

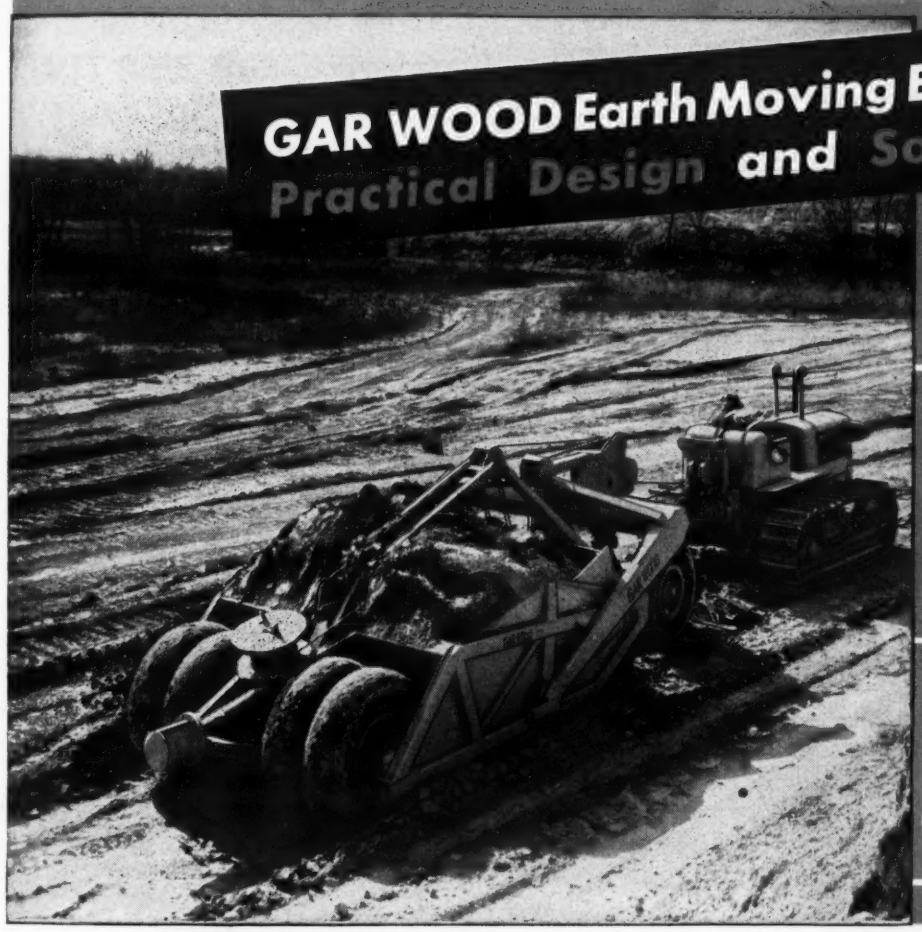
Catalog 35-45 describes the heavier Model 3500, while the two 3000 units are shown in Catalog 30-45. Both booklets are available to CONTRACTORS AND ENGINEERS MONTHLY readers on request. Write the firm at Manitowoc, Wis.

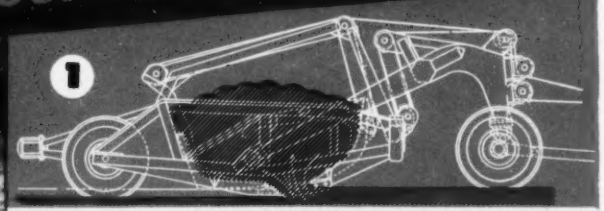
Jones in Caterpillar Post

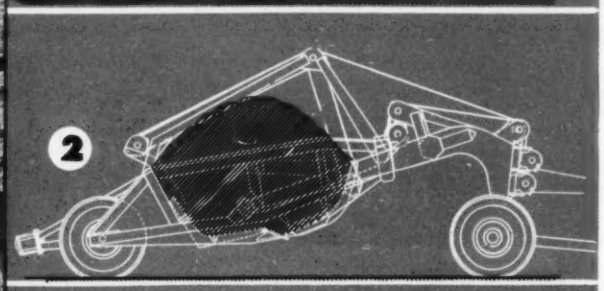
A former Major in the Army Corps of Engineers, Cornell E. Jones, has been named Sales Development Manager by the Caterpillar Tractor Co. He is well known in the heavy-machinery and contracting industry, having served with various highway departments, the J. D. Adams Co., and the International Harvester Co. During the war he was charged with procuring Caterpillar equipment for the use of the Army Engineers.

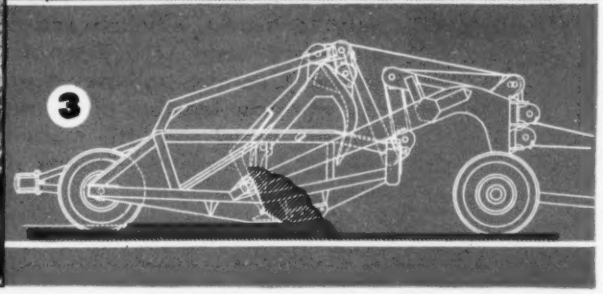
Down-to-Earth Engineering

GAR WOOD Earth Moving Equipment Features
Practical Design and Sound Construction









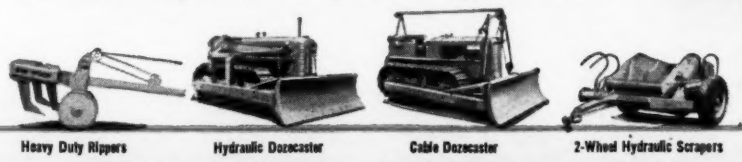
GAR WOOD 4-Wheel Cable Scrapers are *all scraper*, well engineered, honestly built of high quality materials, developed and proved over a period of many years—scrapers that *hold together* and get big yardage jobs done at consistently good speed with an absolute minimum of down time. Some of the many outstanding engineering features, as well as the rugged simplicity of the mechanism, are shown in the three drawings above:

1. LOADING: The self-loading is by positive digging to depths down to 12". "Boiling" action of dirt loads bowl and patented apron evenly by reason of proper angle of the cutting edge. Positive digging action is assured in all types of materials by proper location of draft point.

2. CARRYING: This position provides extremely high clearance of cutting edge, essential in traveling over uneven ground and in discharging sticky materials. Proper weight distribution with exceptionally low center of gravity assures stability—provides for maximum tire life.

3. DUMPING AND SPREADING: The first portion of the load dumps automatically when the apron is raised. The remainder is forced out by *positive rolling ejection.* Note extremely large apron opening to facilitate this ejection of all types of materials. Cutting edge remains stationary throughout cycle, providing for even, *accurate control* of the spread by the heavy duty *Gar Wood Cable Control Unit.*

Contact your Allis-Chalmers dealer. He will be glad to show you Gar Wood earth moving equipment and arrange for you to see on-the-job performance in your locality.



GAR WOOD ROAD MACHINERY
WITH ALLIS-CHALMERS DIESEL POWER

Sold Through
ALLIS-CHALMERS
Dealers Everywhere

ROAD MACHINERY DIVISION
GAR WOOD INDUSTRIES, INC.
DETROIT 11, MICHIGAN

OTHER GAR WOOD PRODUCTS: HOISTS AND BODIES • TANKS • WINCHES AND CRANES • HEATING EQUIPMENT • MOTOR BOATS

This stand was designed to prevent injuries to workers while they are inflating tires.

Safety in Tire Inflation

Safety while inflating tires is provided in a stand built for the purpose from odds and ends in the Highway Department repair shops of Langlade County, Wis., Four Wheel Drive Auto Co. reports. Designed by Shop Superintendent Harvey Tiepner, the stand eliminates injuries which sometimes result when the metal tire-holding bead flies off during inflation. The stand receives the impact of the bead as it bounces harmlessly off the metal bands and not off the mechanic's head.

Perspective-Drawing Aids

Designers, draftsmen, engineers, and others will be interested in a catalog on "true perspective" drawing aids available from the Chas. W. Downs & Son Co., 2280-2300 14th St., Detroit 16, Mich. The firm makes the Truper scales and charts for showing objects with mathematical certainty as they appear in three-dimensional space. A 33-page book on the Truper method of perspective art, as well as sketch sheets, is also among the firm's offerings. The 8-page folder is available on mention of this notice.

Sterling Is Now Making NSCO High-Speed Diesels

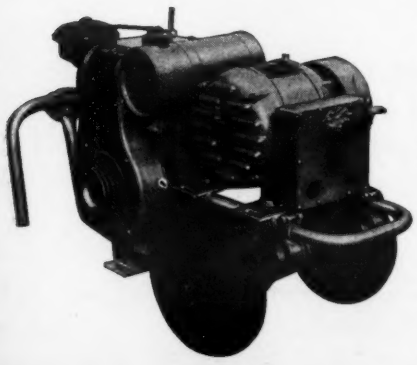
In a joint announcement, the National Supply Co. of Pittsburgh and the Sterling Engine Co. of Buffalo, N. Y., have revealed that Sterling has purchased the manufacturing and servicing rights to the high-speed diesel engines formerly produced at National's Superior Engine Division, Springfield, Ohio. Production of the engines will begin as soon as tools and inventory are transferred to Buffalo. Disposal of the company's rights to the high-speed diesels will permit National to expand its facilities for the production of slow-speed heavy-duty diesels.

Forward movement requires little more than guidance on part of operator.

Tilted to make a second pass.

Here is, bar none, the most convenient, easy to handle, efficient and economical vibratory hand screed on the market today. One man operates it with ease — the vibratory impulses of the motor cause forward travel and little more than guidance is required. It will work right up to walls, is easily tilted and rolled back for second passes, and can be quickly adjusted over a range of nearly 4 feet without changing plank. Gives complete compaction through full depth of the slab and saves the cost of one man on the job. Model SC-11A — 13 ft. for 12 ft. section. Simple rugged 3 phase motor may be operated from commercial power. But, for a truly record-breaking combination use it with a

JACKSON PORTABLE POWER PLANT



Powered by husky Wisconsin engines and equipped with new type permanent magnet generators **which require no adjustment or maintenance,** JACKSON Portable Power Plants give you reliable power when and where you want it. They permit instant adjustment of frequency for placing or finishing either highly workable or very dry mixes, and provide both 3 phase and single phase power for operating all types of electric vibrators, lights and construction tools. Available in capacities of 1.25, 2.5, 5.00 K.V.A., 115 Volt, 60 Cycle A.C. (Model M-2, 2.5 K.V.A., shown at the left.)

Write for complete information and name of nearest JACKSON distributor.

ELECTRIC TAMPER & EQUIPMENT CO., LUDINGTON, MICH.

FOR WAR-TIME LABOR SAVING

Flexible... Adaptable... Relatively Inexpensive... Conveyors as Haiss builds them are the logical answer where man-shortages make each workman's labor precious.... Haiss Portable Conveyors are *engineered* jobs, with loads carried on high-grade ball and roller bearings. Frames are truss-designed for strength without excess weight.

Essential Industry Inquiries and Orders given prompt attention. Write us.

GEORGE HAISS MANUFACTURING CO., INC., Canal Place and E. 142nd St., New York 51, N. Y.

Tops in Asphalt Production

THE MOTO PAVER

The new H & B mixer and paver—self-contained and self-propelled—*mixes, spreads and lays* any type of mixed-in-place bituminous material to any road width, thickness and crown condition. Write for Bulletin MP 46

This Diesel powered Hetherington & Berner portable asphalt plant is engineered to give the volume, uniformity and economy of production which is needed for profitable peace-time operations. The Diesel power unit permits all units of the plant to be individually motor driven, thus eliminating many chains and countershafts and reducing maintenance costs. It also makes the operator independent of local power sources. Sectional type construction makes for quick assembly and disassembly, and for complete portability.

H & B builds portable and stationary asphalt plants of all sizes, types and capacities. Write for literature on the type of plant in which you are interested.

HETHERINGTON & BERNER INC. • 731 Kentucky Ave., Indianapolis 7, Indiana

H&B Hetherington & Berner

Counties Can Use "Public Relations"

Road Commissions Need to Tell Story of Their Work; Good Will Engendered by Publicizing Activities

By RALPH F. SWAN, Director, Public Relations Division, Michigan State Highway Department

✦ PUBLIC relations deals with the human element—learning how to understand and get along with the other fellow. The man who lives by himself need not worry about it, but we who work with the public—with the businessman, the farmer, industry, and the taxpayers (who happen to be our employers)—must constantly attend to public relations as well as to engineering and performance of duty. The things we do and the way we talk to the people we meet day in and day out have a very important bearing on their decision as to whether or not we are doing a good job.

Public relations is something like advertising. You can't always put your finger on what advertising does for you, but you know it pays because it gets results. Advertising sells materials or services. Sometimes the results are quick. At other times sales develop over a period of time. But in the end the investment usually proves worth while. In many ways public relations is a form of free advertising. It brings in good results in the form of favorable public opinion and yet the cost is little as compared to direct advertising. You might also call it propaganda because it works in a comparable way. Propaganda can be deadly and vicious if so intended, but public relations, while working beneath the surface in much the same way, is directed towards promoting good will and friendship.

Each of your employees has a part to play in the public-relations program of your organization, from the top man down to the lowest-paid individual. The attitude of each towards the public is important. A friendly and courteous reply to a question, no matter how significant or how insignificant it may appear to be, means a good public reaction and therefore good public relations; while a discourteous answer is bad public relations and may make a serious enemy for the employee and the whole organization he represents. Don't forget: the first employee of your organization whom the public meets, be he a truck driver, mowing-machine operator, telephone answerer, county engineer, or commission member, will make a good or bad impression for you, depending on what he says and whether he is friendly or unfriendly.

County road commissions are generally lax in seeking the public's support by letting it know of the good job they have been doing. You will create good will among the people of your county, and in return obtain from them their support, if you enlighten them as to problems you are facing and the work you are doing to overcome those problems.

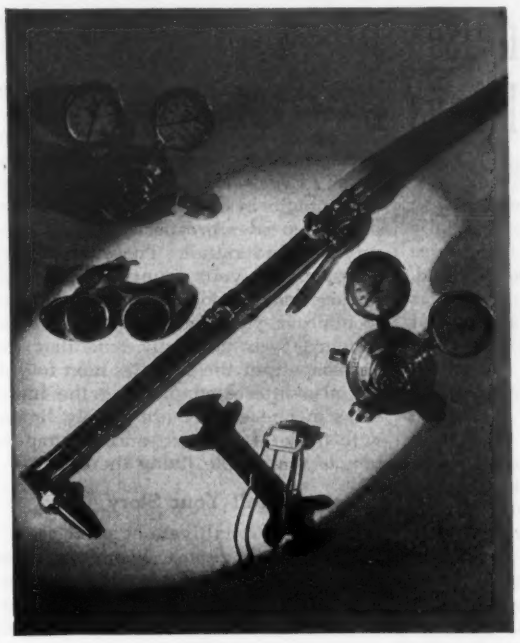
Creating Good Will

Have you ever held an open house and invited the people of your county to inspect your buildings and equipment and to learn more about the work you are doing? The average layman is considerably impressed by huge trucks, snow plows, and other road equipment, particularly when there is a warehouse full of it. People who attend such an open house will be receptive to the idea that your commission is doing an important job in your community. They will go home boosters for your organization and will probably stay that way. Equipment displays at county fairs are also very valuable for reminding your people that you are on the job and well equipped to do it, and that you are playing a prominent part in the government of your county.

The county park, where there is opportunity and need for its installation, is an excellent public-relations idea. Nearly everyone likes the outdoors and the opportunity to rest or enjoy a picnic lunch in an attractive roadside spot. Frequent use of roadside tables along main traveled roads is the next best thing to the roadside park, for the popularity of both is increasing constantly.

When you speak of public relations, you usually have a mental picture of newspaper publicity, radio talks, etc. While all of these produce wonderful results if properly handled, there are other aspects which are also mighty important and enduring over the years. An organization's attitude towards the

(*Continued on next page*)



This One Will Stay On the Job Longer

Often a good cutting torch prevents a costly shut-down of operations.

You cannot purchase a more dependable cutting torch—or one of wider range—than Victor.

Victor Equipment Company
844 FOLSOM STREET
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VICTOR

Ad 104

ROAD BUILDERS' FORECAST

Coming Soon!

new concrete paving records with the MULTIFOOTE DuoMix 34-E Paver

WE PREDICT you'll soon be hearing of new paving records with the MultiFoote DuoMix 34-E. It's not a hard forecast to make . . . Foote designed this great new machine for a record breaker . . . Test performance on the job proved it to be one.

• • •

Better than hearing about new paving records is making them yourself. Here are a few of the exclusive MultiFoote DuoMix features that will help you do it: Speed that clips seconds of mechanical delay off the completely automatic mixing cycle . . . A new crawler design that allows no "nutcracker" action of stones between tread plates; keeps ground bearing pressures equalized on rough terrain; is self-cleaning and balanced for real maneuverability . . . Simple, single-shaft main drive mounted on Timken bearings . . . Quarter-turn rotary transfer and discharge chutes . . . Foote No-Pressure water system . . . Big, solid, fast-charging skip . . . High-speed bucket with all door mechanism outside for positive, non-clogging action . . . AND the typical MultiFoote dependability that has put more of them on the world's jobs than any other paver. Get full data from your MultiFoote distributor—or write direct, today.

THE FOOTE CO., INC.
1916 STATE STREET
NUNDA, NEW YORK

MULTIFOOTE ELEVATED BOOM

Get the extra building and construction jobs that require elevated pouring with the MultiFoote Elevated Boom . . . Not to be confused with limited scope "live" booms . . . Puts full loads up to 18 feet above ground level . . . Adjustable to lower elevations as needed.

ARMY (E) NAVY

Four Army-Navy "E" Awards for Production Excellence!

MULTIFOOTE CONCRETE PAVERS

ADNUN BLACK TOP PAVER

Single Drum 27-E & 34-E DuoMix (Dual Drum) 34-E

County Depts. Can Use Good Public Relations

(*Continued from preceding page*)

public and its methods of dealing with the public from day to day gradually pile up over a long period, to produce a result which is either good or bad, depending upon how the public has been handled. The old sales slogan that "the customer is always right" is a pretty good one to follow in public work, even though you may know on occasion that the customer is wrong. You should never start out by telling an individual that he is wrong, even though it is true. A great deal of patience in listening to tales of woe will pay big dividends in the long run. It is often impossible to comply with requests that are made by citizens of the county. But when this is the case, it is usually a good plan to spend sufficient time with the individual to explain why certain things can not be done and try to leave him in a good frame of mind.

Working With Other Officials

Another big mistake which is sometimes made by county road commissions is failure to appreciate the position of the board of supervisors. It is extremely important that the road commission maintain good relations with the board of supervisors. This usually can be accomplished by working closely with its committee on roads and bridges. Recommendations from this committee carry weight with the board of supervisors. Consequently, the attitude of the board is formed to a great extent by the attitude of this committee. The road commission should hold frequent meetings with the committee on roads and bridges and discuss with them major problems, especially those having to do with appropriations. Taking members of the committee out on trips occasionally, to show them what has been accomplished, is advisable. Close cooperation with this committee as a matter of regular procedure, and keeping the members well informed as to what the road commission is doing at all times, will increase the chances of the committee's approval when it is needed.

Remember that the township supervisor is the legal representative of the people in his township. His wishes and requests should not be ignored. The road commission should go as far as it can, consistent with reasonable policies, in complying with requests of individual supervisors. Such cooperation will help to make up a favorable composite opinion of the road commission on the part of the board of supervisors.

If the board is satisfied with the road commission and its operations, the public will generally also be satisfied, as the supervisors are quick to reflect public opinion. While various kinds of publicity, if properly handled, influence public relations in the right direction, publicity alone is not sufficient to do the job. The publicity must be backed up by satisfactory action in the everyday contacts between the road-commission organization and the public.

Employees—Complainants

Good employee relations also results in good public relations. Happy and satisfied employees can be the best boosters an organization could have. They carry a good word about you to their friends, who pass it on to others. A fine public reaction can result. On the other hand, dissatisfied employees can spread unfavorable word just as rapidly, if not more so, and bad public relations is the result.

Handling of complaints in a manner that satisfies the complainant is a difficult but most important part of the public-relations program of any county road commission. Certainly you are often expected to do things that are financially and physically impossible, but don't let complaints go without investigation or answer. Personal contact is far better than a letter.

Publicity is one of the most important parts of the entire public-relations program. Every citizen is interested in better highways. They mean better living and greater prosperity for community and individual. Therefore, every newspaper in your county is interested in good roads and what you are doing to improve your highways. And, what is more, it is generally true that the newspapers in the counties next to you are also interested, because the highways in one county are closely linked with those of the next and are important to the people living there.

Tell Your Story

It is vital to cultivate a "good press". You'll find in almost every case that your local papers, and radio stations, where you have them, are very anxious to know all about your work and will publicize it regularly. Many county road commissions wait for the newspaper to come to them for news of what the commission is doing. You'll get better publicity if you carry the news of your activities to the paper regularly. When the newspaper knows it can depend on your organization for prompt coverage of your activities and a fair and impartial report, it will rely on you and generally give you just about the kind of article you want. The advantages of such a relationship are quite apparent.

Tell the newspapers what you are doing, how your work will benefit the farmer, the businessman, the tourist industry, and others in your county and in the neighboring county too. Forget about ballyhoo. The newspapers want facts and they don't like personal or political propaganda. Keep your information accurate, to the point, and brief. Cover all important details. If you have someone capable of writing the information in press-release form, request him to do so. Editors like it that way.

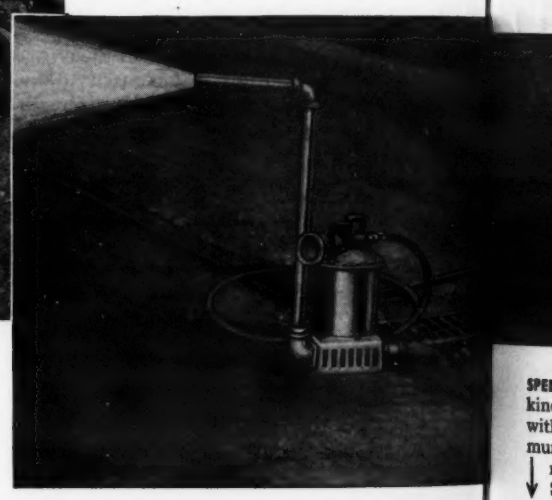
An infallible recipe!

If possible, delegate one man, who seems to be the best publicity agent you have, to make this contact regularly with the newspaper and radio station. The personal contact built up this way over a long period of time becomes very valuable in obtaining favorable publicity.

(*Concluded on next page*)

CP EQUIPMENT... helps keep

RUGGED, HIGH-LIFT CP-7 Portable Sludge Pump operates on the ejector principle. It handles up to 15% solids, without excessive wear or frequent replacement of parts when water contains sand or other matter.



FUEL-SAVING CP Two-Stage, Air-Cooled, Portable Compressors produce 15% to 35% more air per gallon of fuel. The CP gradual speed regulator varies engine speed with air demand, resulting in reduced fuel consumption and less wear. Other refinements include pressure lubrication, Simplate valves, self-adjusting clutch. CP Portables are available in gasoline-powered models of 60, 105, 160, 210 and 315 c.f.m. and Diesel-powered sizes of 105, 160, 210, 315 and 500 c.f.m.

HANDY CP Backfield Tampers quickly pay their way by saving the cost of handling surplus excavated materials, especially in trench work. Advantages include firmer and more uniform tamping, easy control of speed and impact — all available in four different CP models.

REMOVAL OR APPLICATION of nuts and bolts by CP 365-RP (impact type) Wrenches is performed in a fraction of the time required by hand wrenches. Capacity of the 365-RP, 1¼" bolt size. Five other models handle bolts, nuts, from ⅜" to 1¾" bolt size.

LIGHT in weight, fast, and easy to handle, Chicago Pneumatic Clay Diggers are ideal for digging in clay, shale, etc. For general digging in soft to medium hard clay the lighter CP-3 is recommended. For digging in hard clay, shale, etc., there's nothing faster or better than the CP-5.

County Depts. Can Use Good Public Relations

(Continued from preceding page)

Tell your local newspaper how much money you have to spend and explain how you spend it. The readers want to know about this. If you need additional finances, the best way to obtain them is to sell the need through the press. People want good roads and will pay for them, but they will not tolerate careless spending or waste of time. Through publicity you can properly present your picture to your people. Let your papers know, too, that the cities share in the gas and weight-tax returns. Many people do not know this.

Furnish pictures of work being done on your roads. Pictures tell a story far more graphically and clearly than words. Be on the alert for pictures of roads and bridges before improvement is started and later when the job is finished. They will make fine publicity for you and the newspaper will be glad to get them.

Supplying road information, too, is important. For example, the post-war improvement program will require detours. The fewer you have the more popular you will be, for people hate to go out of their way, and if you can maintain traffic while working on highway jobs you will please many people. Continuous publicity on such improvements and detours will prepare the traveler for the inconvenience that he meets along the highway.

Little things from day to day make up a good public-relations program, but they all can be summed up in these two important conclusions: first, give the best kind of public service and do the best job you can; and second, don't forget to tell the world about it!

From an address at the Michigan Highway Conference in Grand Rapids, Michigan, in February.

Care of equipment is as vital now as during the war years. Proper and regular lubrication will help to keep your machines working profitably.

Diesel-Engine Practice Standards Are Revised

Developments in the manufacture of diesel engines during the past decade have necessitated revision of the diesel manual, "Standard Practices for Stationary Diesel Engines", the Diesel Engine Manufacturers Association has announced. The book, first published in 1935, is written primarily for consulting engineers, buyers and users of diesels, and manufacturers of engines, engine parts, and accessories.

The revised manual covers definitions, performance standards, equipment, construction, speed regulation, torsional vibration, intake and exhaust systems, cooling-water systems, lubricating-oil systems, fuel oil, engine-size selection, and many other topics. Twenty-five drawings and charts illustrate the work. A field-test code is presented, and suggestions are made for bids and specifications.

Engineering and sales-department officials of the following firms cooperated in the rewriting of the book: Fairbanks, Morse & Co.; Worthington Pump & Machinery Corp.; Busch-Sulzer Bros.-Diesel Engine Co.; American Locomotive Co.; Nordberg Mfg. Co.; Cooper-Bessemer Corp.; General Machinery Corp.; and National Supply Co.

Copies may be secured from the Diesel Engine Manufacturers Assn., 1 No. La Salle St., Chicago 2, Ill. Price: $2.50.

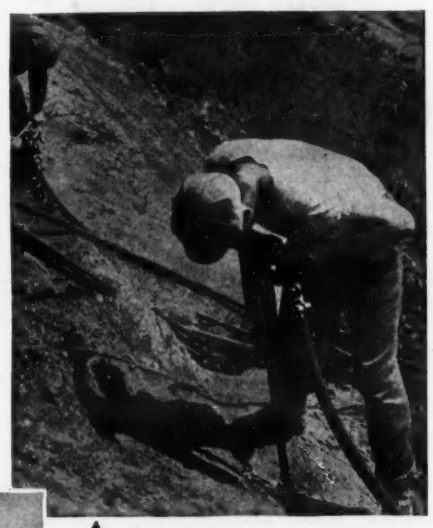
jobs moving on schedule!

Contractors faced with a multitude of projects demanding early completion are quality-conscious buyers of equipment — especially pneumatic tools, air compressors, rock drills, sinker drills, etc.

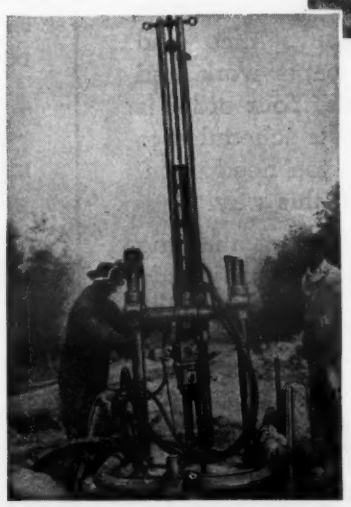
Today, as for more than 45 years — CP equipment stands out for dependable performance and stands up against wear. If you want to know more about equipment that will keep your jobs moving on schedule, send for CP Catalog 600, "Construction Equipment."

SPEEDING demolition work of all kinds, CP Demolition Tools operate with smooth efficiency and minimum kick-back. They are time and money savers for contractors. Sizes range from 25 to 82 lbs.

↑ **ALL PURPOSE** CP Rotary Grinder, equipped with detachable wire brush is ideal for fast surface cleaning on construction jobs. Light weight and true balance make handling easier for the operator.



↑ **PACE-SETTING** CP-42 Sinker Drill has penetrating power, excellent hole-cleaning, strong rotation. This fast 56-pound drill has a sturdy retainer spring encircling the front end, for longer life and lower maintenance. Ideal for general excavation, shaft sinking, quarrying, etc., CP makes sinker drills for every purpose, from the light 28-pound CP-22 Sinker, to the 119-pound, CP-60 heavy-duty spring handle model.



←**THERE ARE** many jobs that call for the light weight G-200 R Wagon Drill to provide one-man operation and faster drilling with the more powerful CP Drifter Drills. G-200 R is readily moved about, easily accommodates 6 foot steel changes; and handles up to 24-foot steels.

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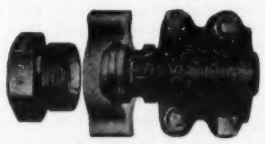

"G J-BOSS"
Ground Joint, Style X-34
FEMALE HOSE COUPLING

Extensively used in pile-driving, grouting, hydraulic and general heavy construction. Ground Joint connection provides soft-to-hard metal seal between stem and spud—washerless, leak proof. Strong, malleable iron "Boss" Offset and Interlocking Clamps anchor coupling to hose with powerful, full circumference grip. Corrugated stem assures extra holding strength. Sizes ½" to 4", inclusive. Cadmium Plated.

"BOSS" MALE COUPLING, STYLE MX-16

Companion to "G J-Boss" Ground Joint Female Coupling, above, and "Boss" Washer Type Female Coupling, Style W-16. Strongest and safest of its kind for all high or low pressure applications. More convenient and economical than regular iron pipe nipples, as each size fits same size straight end hose. Sizes ¼" to 4", inclusive. Cadmium Plated.

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Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

What Kinds of Accidents Does Your Policy Cover?

One of the most fascinating sports in the world, from the standpoint of a winning litigant and his lawyers, is to induce a court to declare that a contract does not mean what an adversary says it means. Take, for example, a case that was decided by the Kentucky Court of Appeals. A pedestrian fell on a sidewalk because of the sand and gravel a contractor's truck had accidentally spilled on it when crossing the walk. The contractor passed the buck to the insurance company which had insured him against liability for accidental injuries resulting from his construction operations. The insurance company crossed its fingers and said, "So sorry, but our policy distinctly says that it does not cover *injuries caused by an automobile or truck.*" "So sorry, right back at you, insurance company, but this accident was not caused by the truck but by what fell off it, due to the manner in which it was loaded," rejoined the contractor. Neither party could be shifted from his line of reasoning, and that helped two batches of lawyers to earn an honest living and incidentally gave a trial judge and a bench-ful of appellate judges an excuse for drawing salaries. When the legal battle smoke cleared away, the contractor stood forth the "winnah, by a technical knockout". The Kentucky Court of Appeals declared that it was *obvious* that the clause in the policy excluding liability for injuries caused by motor vehicles was intended to be limited to injuries caused by *collision with such vehicles.* (United States Fidelity & Guaranty Co. v. Breslin, 243 Ky. 734, 49 S. W. 2nd, 1011.)

Govt. Liable When Dredge Harms Near-By Oyster Bed

By special act of Congress, the United States Court of Claims was given jurisdiction to determine liability, if any, of the Government for injury to privately owned oyster beds. The injury resulted from dredging operations conducted by the Government's contractor in constructing a Naval air station. The suction dredge which was used stirred up mud and silt which water currents spread over the oyster beds. The court awarded $20,000 damages against the Government (Beacon Oyster Co. v. United States, 63 Fed. Supp. 761.). The award was based (1) upon an assumption that the Government negligently failed to adopt a different method of dredging, and (2) on a finding that the oyster company had done all that it could to avoid or minimize the injury resulting to its beds. The Court of Claims said that "the Government's engineers may have found the use of a suction dredge desirable, even necessary, and they may have handled it efficiently, but that possibility does not relieve the defendant of liability, under the special jurisdictional act, of responding in damages. . . .

"It is impossible to arrive at the amount of damages with any mathematical accuracy," said the court, adding, however, "This situation does not constitute a bar to recovery." The damages finally arrived at and awarded were approximated in the light of the facts shown.

Tardy Contract Signing No Excuse for Work Delay

It would seem that ordinarily a contractor acts at his own peril in commencing work on a job before mutual signing and delivery of the contract documents. However, according to a decision lately rendered by the United States Court of Claims, circumstances may be such that the contractor is not justified in deferring commencement of work until he receives a copy of the contract executed by the owner.

In the case of Sachs v. United States, 63 Fed. Supp. 59, plaintiff claimed damages for delays caused, allegedly, by the Government in performance of a contract to install an electric distribution system at Fort Sam Houston in Texas. One item of the claim was based upon tardiness of the Government in executing a written contract, which called for commencement of work on February 8, the day following award of the contract. Plaintiff-contractor received copies of the contract for execution February 12 and promptly returned them signed and for signature on behalf of the Government. The contractor did not receive his copy of the contract, signed by the Government, until some time between March 16 and 28. Deciding that the contractor was not justified in delaying commencement of work, the Court of Claims said, in part:

"We are of the opinion that defendant's delay in the execution of the contract afforded no sufficient excuse for plaintiff to postpone commencement of work under it. The contract was prepared by defendant and promptly mailed to plaintiff for signature. Plaintiff was, therefore, fully aware of the terms of its contract and *it knew that its execution by the defendant was a matter of course.* There was, therefore, no reason for it to delay commencing the work. The case of Thomas Earle & Sons, Inc., v. United States, 90 Ct. Cl. 308, relied upon by plaintiff, is not to the contrary. In that case plaintiff asked permission to proceed prior to receipt of notice to proceed and prior to approval of the contract. It was permitted to do so, but with the understanding that it would be at its own risk. It sued for damages for a delay caused by a stop order issued between the date it had started the work and the date notice to proceed was received. Such are not the facts in the case at bar.

"Moreover, the findings show that the plaintiff was largely responsible for the delay in commencing work by failing to furnish for approval the equipment to be used in carrying out the contract."

Ceilings on Crushed Rock

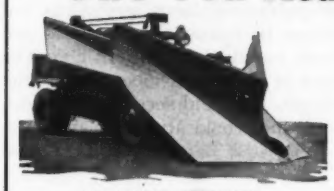
OPA failed in an effort to pin a Florida rock company down to a ceiling price of 60 cents per ton for its crushed rock, which was suitable for use either as railroad ballast or for dam construction.

In January, 1942, the company agreed to deliver rock to a Government dam contractor at $1.50 a ton. Deliveries were scheduled for March, but were delayed until August because the contractor was not ready.

In March, 1942, the company delivered the same kind of rock to a railroad, for use by it and not for resale, at 60 cents a ton, under a pre-existing contract. Later, however, a new contract was made at 85 cents a ton. Still later, one was made at $1.00. Relevant to these new contracts were two facts: (1) the railroad could obtain bal-

(*Concluded on next page*)

Are You Ready for Next Winter?



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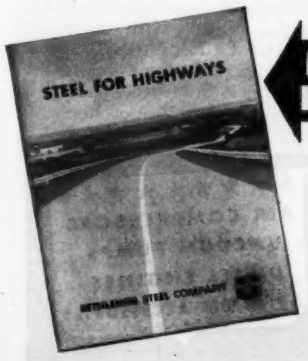
CONCRETE SLAB SPACERS — TURNBUCKLES
TIE RODS, SPIKES, BOLTS AND NUTS
TIMBER BRIDGE HARDWARE
SHEET AND H-BEARING PILING



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BETHLEHEM STEEL

Avoid Legal Pitfalls

(*Continued from preceding page*)

last rock only at the company's quarries, and (2) the rock company could not furnish it at 60 cents without loss to itself.

OPA filed an injunction for treble damages against the rock company for charging the railroad $1.00 a ton. It argued that the contract operative in March and specifying 60 cents fixed the ceiling price. However, Judge Akerman of the United States District Court, Southern District of Florida, decided that the earlier contract made with the Government contractor in January, 1942, established the ceiling price for the commodity at $1.50. He ruled that OPA was therefore not entitled to an injunction.

Furthermore, Judge Akerman ruled that if any one had had a cause of action for treble damages on account of the $1.00 charge, it was not OPA but the railroad company, which was the ultimate consumer of the rock. (Bowles v. Seminole Rock & Sand Co., 59 Fed. Supp. 751.)

Contract Not "Completed" When It Has Been Canceled

A Georgia statute says that no suit can be brought on a public contractor's bond "after one year from the completion of said contract and the acceptance of said public building or public work by the proper authorities". An excavation subcontractor on a state highway bridge job was ordered by the general contractor to suspend work for want of money to pay him. About seven months later, the highway department canceled the contract before its completion, but the subcontractor did not learn of this until more than a year later when he promptly brought suit on the contractor's bond. The surety company's lawyers argued that the claim was outlawed under the statute.

The Georgia Court of Appeals decided that the statute did not cover the case. The court said: "It will be observed that the statute makes no mention of a cancellation of a contract, but fixes the one-year limitation from the 'completion' of the contract and 'acceptance' of the project. It is our opinion that the statute should be strictly construed and not extended to apply a limitation to a canceled contract." (National Surety Corp. v. Wright, 29 S. E. 2d, 662.)

Limit Assessable Damages In Breached-Contract Case

A guide to the measure of damages assessable against a seller of used construction equipment when he has failed to live up to his part of the agreement is to be found in a decision rendered by the North Carolina Supreme Court in a recent case (Troitino v. Goodman, 35 S. E. 2d, 277). Plaintiff, a road contractor, sued defendant, a dealer in used road machinery, for damages claimed under three different transactions.

One sale covered two used tractors, one with bulldozer attached. The dealer agreed to put the tractors in first-class condition for immediate use and to secure leases of them by third parties for at least three months, the dealer to receive 10 per cent of rents collected. He did not make the repairs or secure any lease. The Supreme Court ruled that "the proper measure of damages for the breach of the agreement . . . would seem to be the difference between the *value* of the" tractors "as delivered and what the value would have been if they had been put in first-class condition for immediate use as promised, plus a fair rental value for a period of three months, less commission on such rental value". The court rejected a view that the damages should be measured by the difference between the *purchase price* and the value of the equipment as delivered, because the evidence indicated that, without any fraud or overreaching practiced by the dealer, the contractor paid more for the equipment than it was worth. And the court refused to allow as damages an item covering the contractor's expense in trying to put the equipment in proper repair, because that element of damage was covered in allowing the difference between the value of the machinery with and without the agreed repairs.

The second sale covered a used tractor, which the dealer agreed to repair and rent to a third party for three months. He failed to keep his agreement. The court decided that the trial court had improperly awarded the contractor a return of the down payment he had made on the equipment, because suit was brought for damages for breach of the contract and not for a cancellation of the purchase. The court noted the vital distinction between a *claim for damages* for breach of a contract, which necessarily implies an affirmance of the contract itself, and a *claim for cancellation* of the contract. Both damages and cancellation cannot be consistently claimed in the same suit. Furthermore, neither party to a contract of sale is entitled to a judgement canceling it, for wrong of the other party, without offering to fulfill his own part of the agreement, which, in this case, would mean offering to return the equipment on being repaid what had been paid on account.

The third sale involved a trench hoe for $750 which the dealer agreed, but failed, to attach to the contractor's crane. The trial judge allowed the contractor the full amount paid for the hoe. That was in error, said the Supreme Court, for it was evident that the hoe could have been attached to the crane at an expense of not more than $25. The Supreme Court said: "It is true that where a party breaches his contract without any valid excuse, the courts are not disposed to permit him to prescribe the rights of the innocent party. Nevertheless, it is a sound principle of law that one who is injured . . . by the wrongful act of another is required to protect himself from loss, if he can do so with reasonable exertion or at trifling expense; and ordinarily he will be allowed to recover from the delinquent party only such damages as he could not, with reasonable effort, have avoided." So, since an expenditure of $25 would have sufficed to attach the hoe to the crane, that was the limit of the contractor's recoverable damage.

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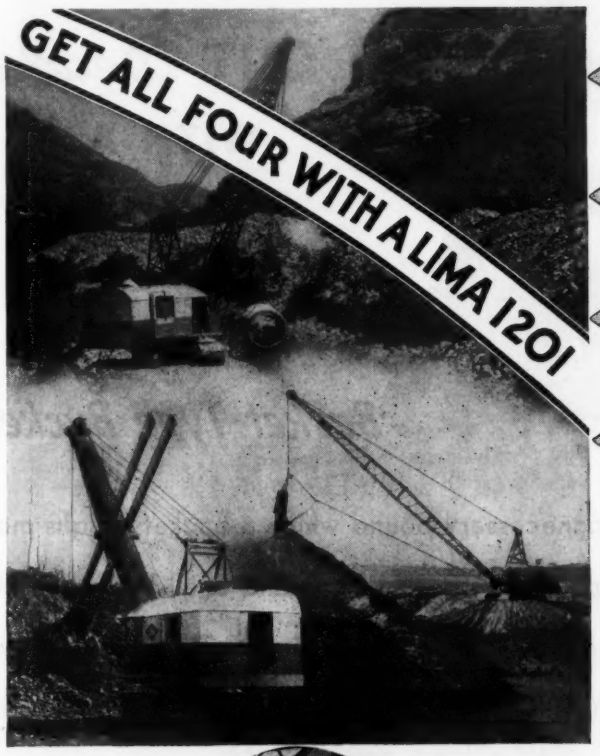

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The LIMA Type 1201 is designed, engineered and built for heavy duty construction—for the job that demands more than the ordinary. As a standard shovel it is equipped with a 3½ cubic yard dipper, 32' 6" boom and 22' 0" dipper handle. For high lift work a 42' 0' boom, 32' 0" dipper handle and 2½ cubic yard dipper can be furnished. As a crane it has a lifting capacity of 65 tons. Dragline capacities vary, depending upon the nature of the work. Whatever the job, whether it be tough rock digging, working as a dragline, in wet swampy ground or crane work where heavy lifts must be made with utmost precision, you'll find that the LIMA Type 1201 will fit into your plans exactly. Every day, more and more users of excavating machinery are turning to LIMA for the most in excavator design.

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Howard Danner and Harry Helm of Carthage, Mo., (above) are soil-conservation contractors. At left the partners' Caterpillar D6 with LaPlant-Choate bulldozer constructs a stock pond in Jasper County. The work involved moving about 3,000 cubic yards and covering the dam with black earth.

Reserve Officers' Unit Is Formed by Seabees

With an eye to creating active interest in post-war naval shore construction, the Navy has launched an officer-reserve organization for former Seabees. Nearly 10,000—almost 98 per cent—of the officers in the Navy's Civil Engineer Corps during the war were reservists. These men are being sought for membership in the new group.

The organization is to be voluntary in nature, and its purpose will be to keep members abreast of developments in military engineering. The Navy's Bureau of Yards and Docks is working with the Bureau of Naval Personnel in the formation of this group. A former consulting engineer from Seattle, Captain C. Ken Weidner, CEC, USNR, is directing the work of organization.

All officers have been mailed questionnaires asking for suggestions on the new organization. Replies indicate a desire for a decentralized group of a professional nature. Other proposals would include a program of monthly seminar meetings, and a tentative training program which would give the reservists two-weeks' active duty each year with some project of the Bureau of Yards and Docks.

C&EM readers who served as officers with the Seabees can obtain further details about this proposed organization by writing Captain C. Ken Weidner at Room 2804, Arlington Annex, Arlington, Va.

Handle Blue Brute Line

Exclusive distribution rights for Blue Brute pavers and mixers have been granted sixteen firms by the Ransome Machinery Co. These dealers are:

Wilhelm-Davies Co., Hamden, Conn.; Arrow Supply Co., Wilkinsburg, Pa.; Burford-Toothaker Tractor Co., Montgomery, Ala.; Epperson & Co., Tampa, Fla.; Highway Equipment & Supply Co., Orlando, Fla.;

Jackson Road Equipment Co., Jackson, Miss.; Dempster Bros., Knoxville, Tenn.; Shaw Equipment Co., Dallas, Texas; Carroll-Edwards & Co., Cincinnati, Ohio; Drott Tractor Co., Milwaukee, Wis.;

And, in the west, Caird Engineering Works, Helena, Mont.; Interstate Truck & Equipment Co., Billings, Mont.; J. K. Wheeler Machinery Co., Salt Lake City, Utah; Bud Fisher Co., Albuquerque, N. Mex.; Andrews Equipment Service, Portland, Oreg., and Spokane, Wash.

Blue Brutes can be obtained in Alaska from the Airport Machinery & Storage Co. of Anchorage.

Safety-Equipment Line

Much new safety equipment has been announced by the American Optical Co., Southbridge, Mass. The twenty new products include safety goggles, gloves, shoes, and similar items. Many of these products are applicable in welding and other shop operations.

Literature on the equipment can be secured by writing to the firm.

Returns to LeTourneau

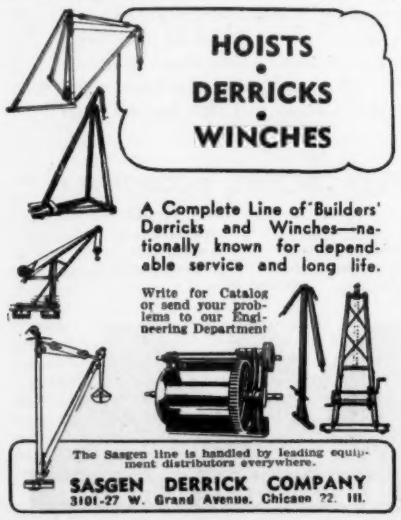
Dan K. Heiple has returned to R. G. LeTourneau, Inc., Peoria, Ill., from a tour of duty with the Navy. He is a Field Engineer in the LeTourneau Installation Department which provides a consultation service for users of heavy earth-moving equipment.

New Gear-Type Pump For Hydraulic Units

A new gear-type hydraulic pump for use in such hydraulic systems as those in bulldozer-blade controls, road-machinery controls, hydraulic presses, and similar units, has been announced by the Aro Equipment Corp., Bryan, Ohio. Known as Model H657-A, it will deliver pressure up to 2,000 psi with 5½ gpm at 2,800 rpm, Aro says. The unit's overall efficiency above 500 psi is said to be 85 per cent or better, and its volumetric efficiency, using SAE No. 10 oil, to be above 90 per cent.

Simplified construction and high efficiency are cited as features of this pump, which employs Nitralloy gears in a cast-iron body of "sandwich" design. Ample porting to standard pipe sizes, and adaptable mounting flanges are provided in its construction. The unit approximates a 3½-inch cube.

Further details on this new hydraulic pump can be obtained by writing to the firm.



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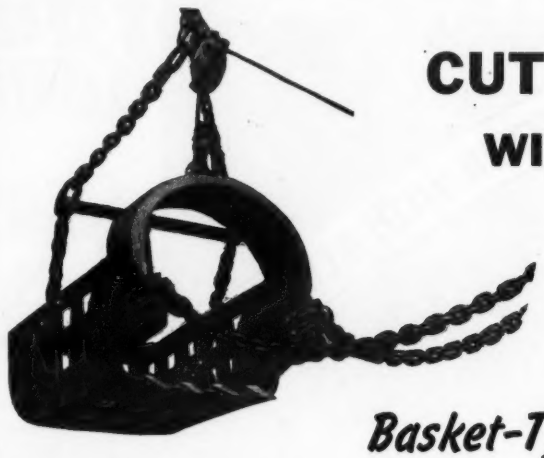

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Every unnecessary pound which a bucket weighs means less dirt it can move per trip. Yaun's Basket-Type and Shell-Type buckets are lighter, save you the cost of carrying deadweight. They are designed to give a heavier load of PAY DIRT. Cut operating costs with lighter, clean-dumping Yaun buckets. Manufactured in sizes from 3/8 yards to 24 yards.

Check These Advantages Of Our Patented Basket-Type Bucket

1. **CLEANER DUMPING** because there is no suction to hold back the discharge.
2. **100% PAY LOAD**—no dirt sticking in the bucket for a free ride back to the pit at your expense.
3. **QUICKER-DRYING FILL** because the open construction eliminates water from the load.
4. **NO DEADWEIGHT**—this bucket is one-third lighter than buckets of similar capacity.

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DRAGLINE BUCKETS

Patented
BATON ROUGE, LA.

"More YARDAGE With a YAUN"

Ford Trucks Last Longer

"WE'VE FOUND FORD TRUCKS TOPS IN ECONOMY AND RELIABILITY!"

"Ford Trucks are the most economical and reliable of all trucks we have ever used in our business," wrote Mr. C. C. Mangum, grading contractor, of Raleigh, N. C., recently.

"We have been using Ford Trucks for the last twenty years, starting with the Model T, then Model A, and on down to our present fleet of nine Ford units."

Mr. Mangum's work includes concrete construction as well as grading, and his experience with Ford Truck equipment is typical of that of hundreds of construction and engineering firms, large and small. All through the industry, it's common knowledge, proved over the years, that Ford Trucks stand up splendidly in the toughest off-the-road service.

There's a new 1946 Ford of two-ton rating, with two-speed axle and 8.25-20 dual rear tires. That's profit-news to heavy hauling operators. And there are more than thirty important engineering advancements in the 1946 Ford Trucks, designed to make them still more economical, more reliable, more enduring! Check with your Ford Dealer for early delivery!

Ford

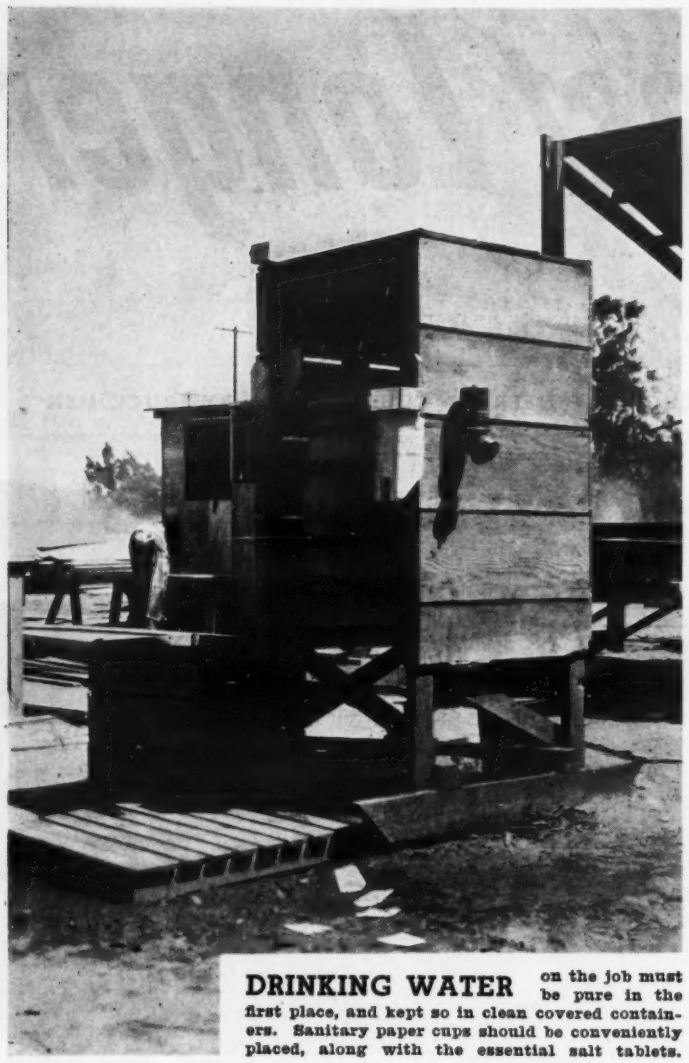
FORD ADVANCED ENGINEERING!

THE FAMOUS V-8 ENGINE, for toughest service, now 100 HP, with NEW steel-cored Silvaloy rod bearings for trebled endurance • NEW Flightlight aluminum alloy 4-ring pistons for added oil economy • Tougher, rust-proofed valve springs • NEW moisture-sealed distributor • NEW coolant-saving radiator closure • Auto-balanced carburetion for still more thrifty power • Servicing simplified still further. And the rugged, thrifty 90 HP Ford six-cylinder engine, for stop-and-go jobs, with many important advancements, available in all except C.O.E. chassis.

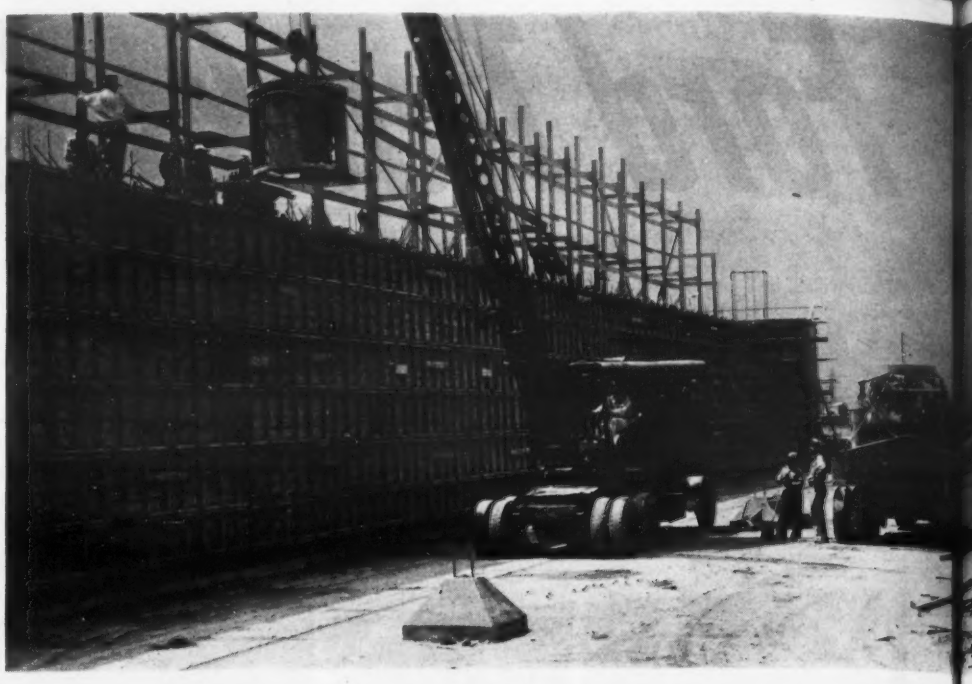
Ford Truck rear axles—world-famous for load-lugging—provide generous reserve capacity • Light duty chassis have sturdy ¾-floating axles with triple-roller-bearing, straddle-mounted pinion; full-floating axles in all other chassis • 2-speed axle and vacuum power braking for 2-ton rating • Improved 4-speed transmission at extra cost in light duty chassis, standard in all others.

FORD TRUCKS

MORE FORD TRUCKS IN USE TODAY THAN ANY OTHER MAKE



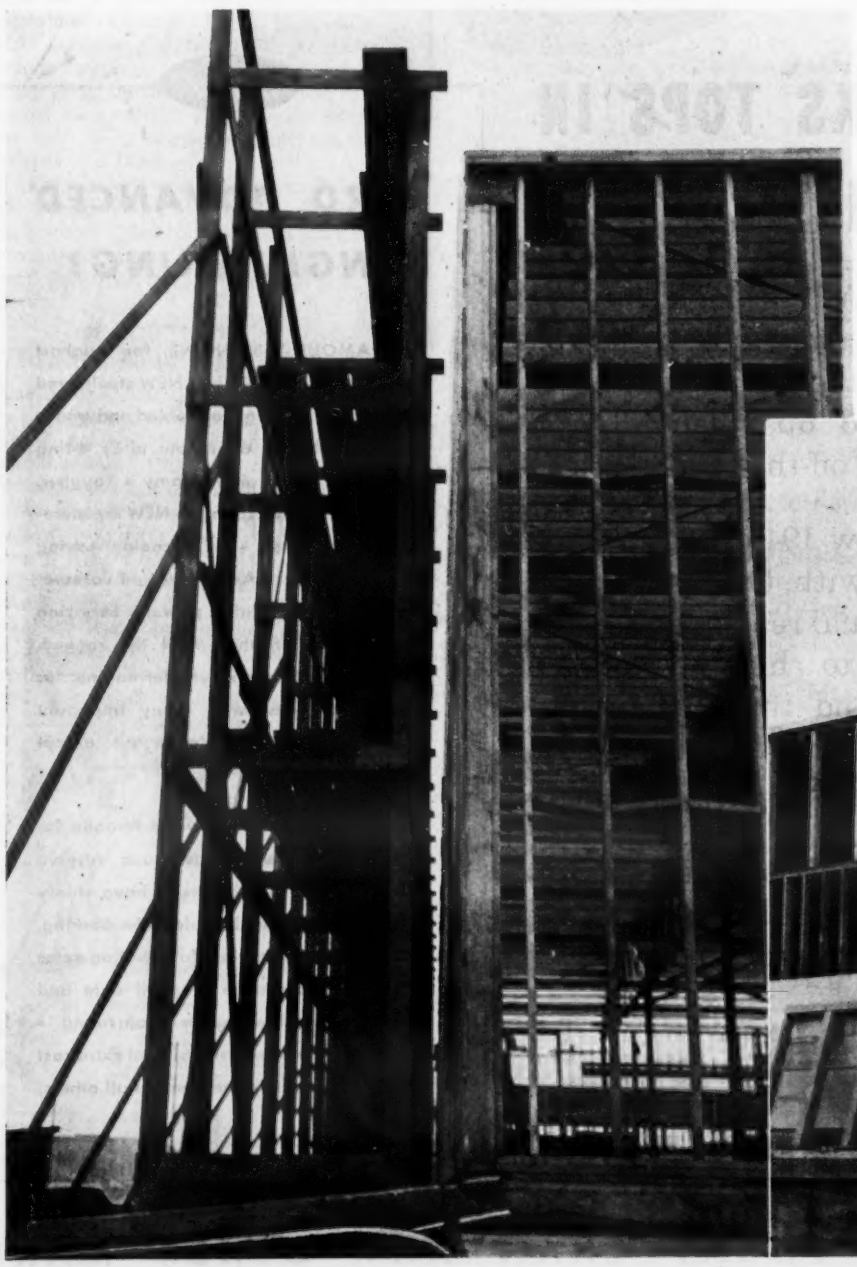
DRINKING WATER on the job must be pure in the first place, and kept so in clean covered containers. Sanitary paper cups should be conveniently placed, along with the essential salt tablets.



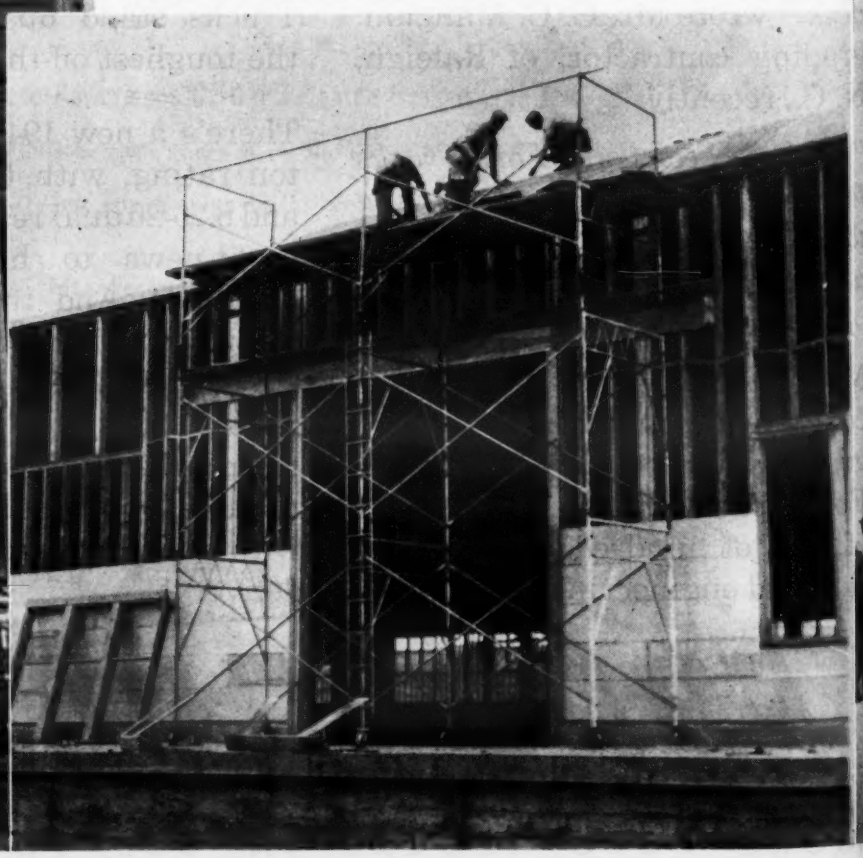
Fewer Accidents M
Greater Job Pro

Some Safety Suggestions Whic Will Increase Efficiency, and Impr W Practice Them on Your Job; ety

(U. S. Engineer Departm nt)

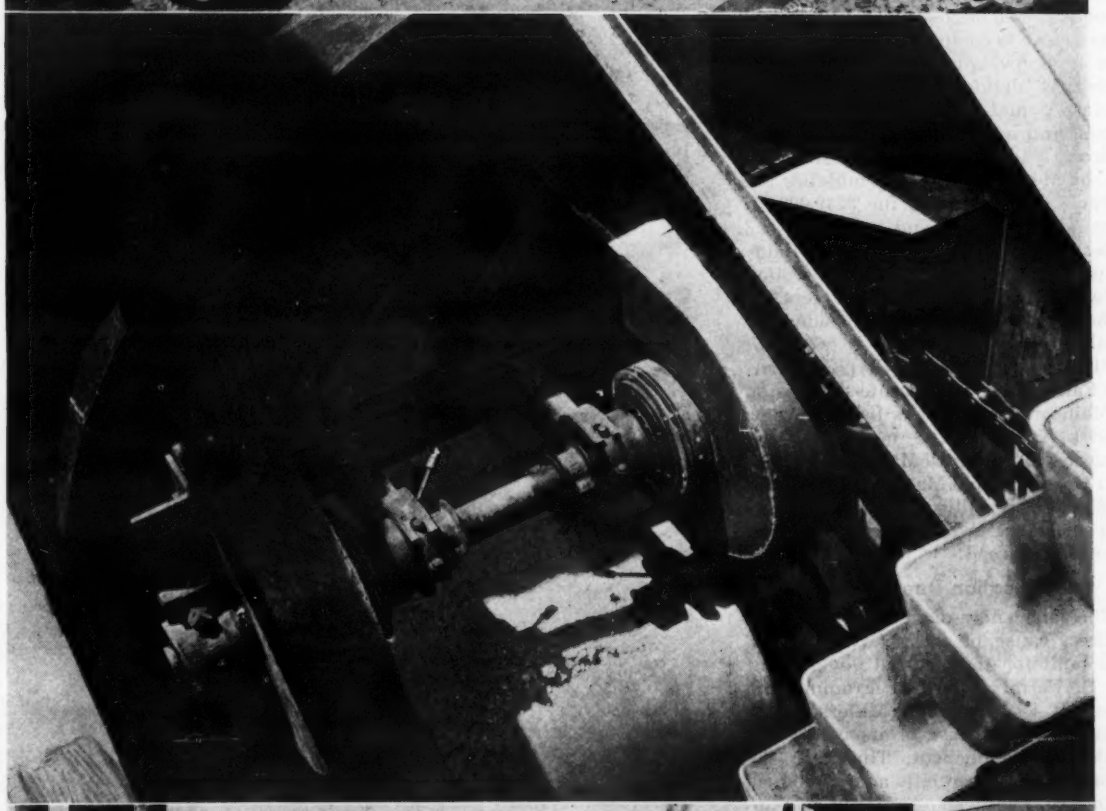


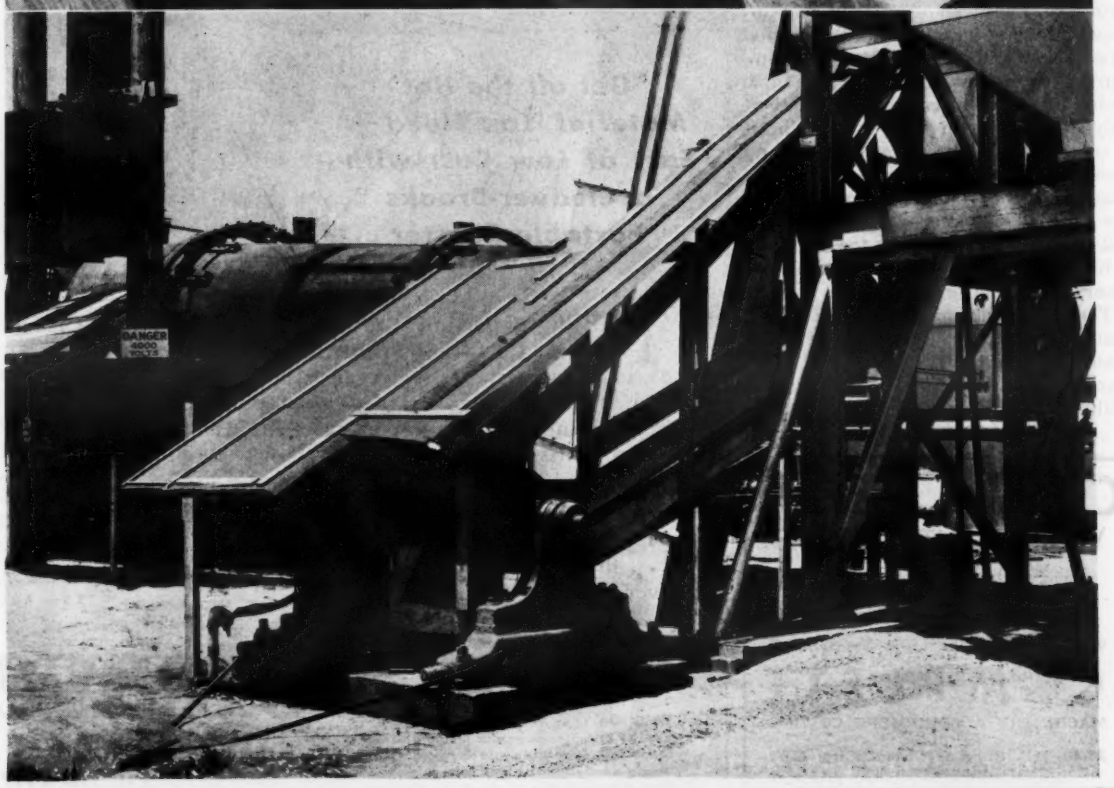
SCAFFOLDING and working platforms should be sturdy and well built; they should also provide barricades to prevent workmen from falling off. (Left), enclosed scaffolding protects busy workers and speeds up the job. (Below), this type of scaffold is safe, easily erected, and quickly moved. (Right), this view of a wall form on a concrete-channel project shows how safety platforms have been built on the top of the form.



TAGLINE. On a concreting job at an Army Ordnance Depot, (at left), a tagline on the concrete bucket absolutely controls its movement, thereby safeguarding concrete workmen as well as speeding up the pour. This device can prevent the many injuries to workmen who are hit by a sudden swing of a bucket.

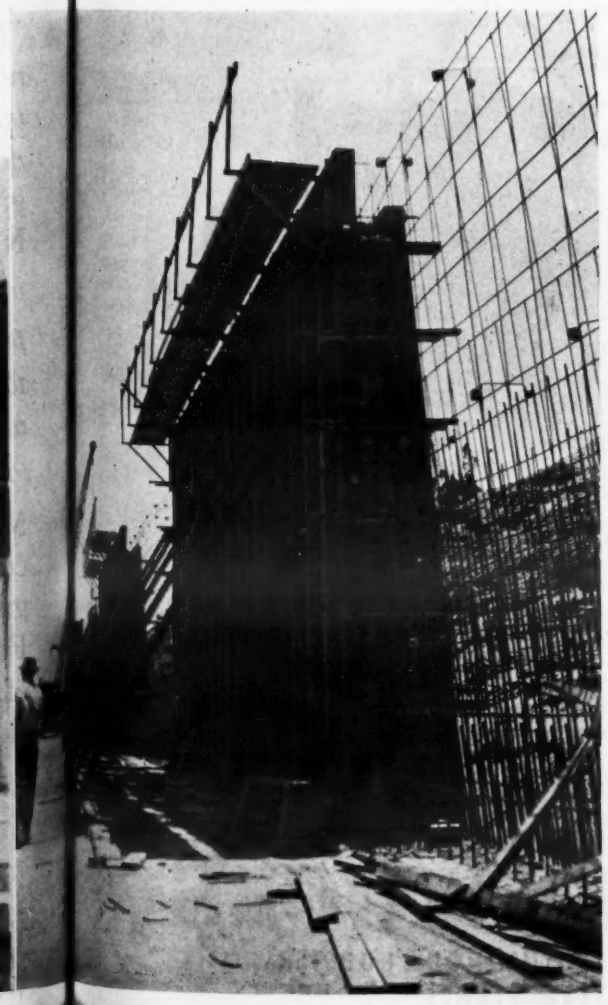
GUARDS. Machinery and moving parts should be enclosed to protect workmen from being caught in them. Such protection makes for safety and increases worker efficiency. (Top right), batch-plant workers are protected by sturdy guards around the cold elevator on an asphalt plant. (Middle photo), gears on a hot-mix plant are well enclosed; workmen don't have to waste time maneuvering to avoid getting caught in them. (Bottom right), here is another example of combined safety and efficiency. Timber guards around a motor support a roof which protects it from rain.





ts Mean
Production

Vhich Will Cut Lost Time,
Impro Worker Morale;
ob; Safety Always Pays



Heavy Grading Needed For Highway Relocation

Charts and Records of Progress Aid Job Planning; Three Contractors' Work Includes Grade Separation

✦ BACK in 1940-1942 when Birch Hill Dam was under construction in western Massachusetts, the State Department of Public Works planned to relocate a section of U. S. 202 between Templeton and Waterville in Worcester County. This was made necessary by the fact that the road would be under water when the flood-control project impounded water behind the dam to keep the Connecticut River in check. The war intervened, however. Although the dam was completed, the new road had to wait until last autumn before the Department could give the go-ahead signal on this much needed construction.

Although the total length of the project is only a trifle over 5 miles, its cost, including a grade-crossing-elimination structure, will be over $500,000. It will take a year to complete. Three contractors are now working on the project which is divided into two grading, drainage, and macadam-paving contracts, and a separate contract for the railroad bridge. The Lane Construction Co. of Meriden, Conn., is building the lower section of road for $249,000. It runs almost north and south for 1.3 miles between Templeton and Baldwinsville. The upper 3.7-mile section between Baldwinsville and Waterville, although longer, had a considerably smaller earth-work item. It went for $204,000 to the Kelleher Corp. of Turners Falls, Mass. To separate the Boston & Maine railroad tracks from the new road at Baldwinsville, a contract was awarded to the M. DeMatteo Construction Co. of Boston, Mass., on its low bid of $105,000. It will construct a concrete and steel structure to carry the highway over the railroad.

Relocation Due to Dam

The fairly new dam, which was the indirect cause of the road relocation, was built for the Federal government by B. Perini & Son of Framingham, Mass. It is located on Millers River, about 30 miles east of its confluence with the Connecticut. Thus far, the dam, which is essentially a flood-control structure, has been used only once to impound water when a flood threatened cities below and to the west of the dam. During its construction the Boston & Maine Railroad relocated its tracks. But only temporary highways were built to serve that territory when the existing ones were obliterated by topography changes of the valley. The new line of the railroad was placed above contour 852. The new road will be too, to make it higher than the top elevation of any reservoir formed in the future.

The new road is at least 30 feet higher than the old. It lies about ½ mile to the east of the old one, and a good 2 miles from the dam. Since the U. S. Engineers built the dam, the Federal government agreed to pay for any road relocation that was the result of its construction. The State, however, wished to have a 24-foot macadam instead of the original 22-foot road; so the Federal government is paying for eleven-twelfths of the cost of construction, the State for the remaining one-twelfth.

Both road contractors moved in on the job about the middle of October, 1945, and worked through the winter on the grading and drainage structures as much as the weather would permit. This year as the grading is completed, a 12-inch layer of gravel sub-base, 26 feet wide, will be added as a foundation for the 24-foot pavement. The pavement base course will consist of 3½ inches of crushed stone bound with sand. Its top course of 2½ inches of crushed stone will be penetrated by 2 gallons of asphalt to the square yard, sealed with an application of ⅜ gallon of asphalt to the square yard, and covered with pea stone. The finished surface will have a crown of ¼ inch per foot. The job will be completed next autumn.

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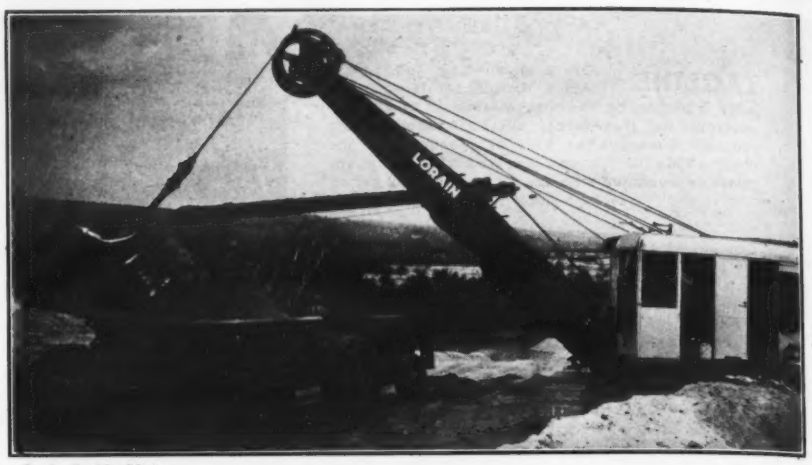
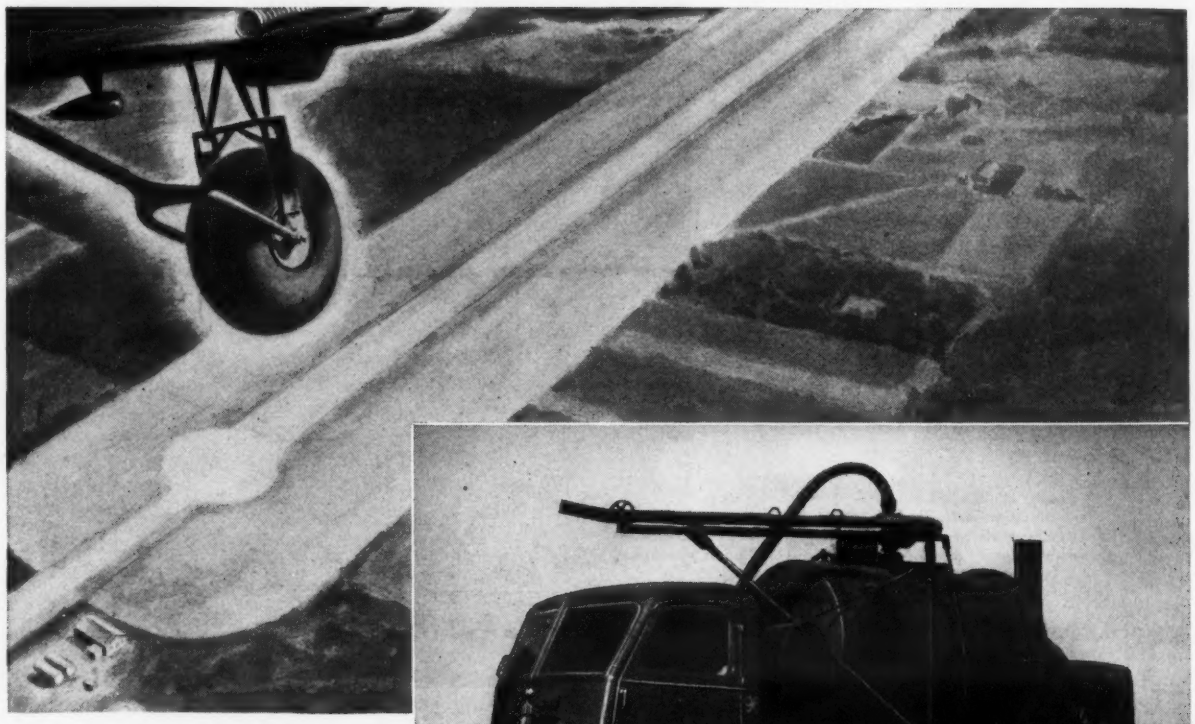


C. & E. M. Photo

For hauls over 1,000 feet, Lane Construction Co. used a fleet of eight 8 to 10-yard Euclids. Here a Lorain 80 2-yard shovel loads one of these units.

Building a Highway.. Flight Strip..Airport?



Get all the Hot Material You Need— Fast at Low Cost with a Cleaver-Brooks Portable Booster

THE big opportunity to show how Cleaver-Brooks Portable Boosters make quick work of auxiliary airports, emergency landing fields and strips came when they were put to use in meeting vitally important "RUSH" war assignments.

Hundreds of these boosters were on the job heating the oils and bituminous materials as needed. Construction crews were not delayed . . . flight strips and airfields grew seemingly over night.

Cleaver-Brooks Boosters circulate and pump oils and bituminous materials while heating (approximately three times faster than is possible with steam) to a wide range of application temperatures as required on the job.

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Heavy Grading Needed For Highway Relocation

(Continued from preceding page)

Over most of the job, the soil is sand or gravel. This was excavated and moved readily enough. But in several locations large pockets of peat were encountered which had to be removed and replaced with suitable porous backfill. The peat was stockpiled at one side for dressing the slopes later. As the new alignment went through land of very little value, borrow pits were opened up when necessary beside the road. These helped to reduce the haul considerably. The fact that no rock was encountered bore out the results of a seismographic survey which the State ran over the line, setting off a dynamite charge every 10 feet in a metal cylinder. The findings were plotted on the vertical axes of a graph which showed that hard material was well below the excavation line.

Shoulders are 6 feet wide, and on low fills the slopes are built 4 on 1. Higher fills are 1½ on 1 and will be protected by guard rails. Cut slopes are 2 on 1, and when material is taken from a roadside borrow pit, digging begins at a point 12 feet above the surface of the road and extends back in the slope. In this way a more symmetrical alignment is retained than if the pit were gouged out at road level. Desirable locations for pits are indicated by the engineers to the contractor, who then makes the necessary arrangements with the property owner.

Lane Contract

In its contract on the south section of the new road, the Lane Construction Co. had 262,500 yards of earth to move. On hauls up to 1,000 feet and where the tops of hills had to be leveled off so that other equipment could be put to work, scrapers were found to be most effective. Two LeTourneau 12-yard Carryalls, pulled by Caterpillar RD8 tractors with an RD7 acting as a pusher, engaged in these operations. Three other RD8 tractor-dozers spread the material on the fills, or knocked out stumps in clearing and grubbing. In the preliminary going the scrapers moved down grades as steep as 15 per cent until their constant work flattened out such hills.

For hauls over 1,000 feet, a fleet of eight Euclids averaging 8 to 10 yards each was used; a Bucyrus-Erie 44B 1¾-yard shovel and a Lorain 80 2-yard shovel loaded them. To keep a record of performance the hauls were divided into two classifications: from 1,000 feet to ½ mile, the category into which most of the work fell, and from ½ to 1 mile. An International TD-18 tractor-dozer also worked to spread fill material; the moving equipment and a dual-drum sheepsfoot roller compacted it in 1-foot layers.

At the start of the work each shovel moved about 2,000 yards of material in an 8-hour day, and each scraper accounted for an additional 800 yards in the same length of time. This 5,600-yard daily total was increased to an average of 6,000 yards a day in a short time. Hours were from 7:30 a. m. to 4:30 p. m. During the hour for lunch, the equipment was greased by a lubricating unit mounted on a truck. An Ingersoll-Rand 60-cfm portable air compressor was used to inflate the tires on the earth-moving units.

This equipment could not be used to remove peat, however. Along 700 feet of road in one location, 40,000 yards of peat had to be removed to a depth of 30 to 35 feet, and suitable material brought in to replace it. The peat was excavated by a Lima with a 100-foot boom; it used either a Page 2-yard dragline or a Williams 1¾-yard clamshell bucket. Another excavator used in this work was a Northwest 77 crane with an 80-foot boom and a Williams 1½-yard clamshell. This latter piece of equipment was also used in the excavation for a good-sized bridge which was part of the Lane contract. When the earth work is finished, a 3-inch layer of peat will be spread over the slopes, covered by 2 inches of mulch, and topped by 2 inches more of peat, to form an excellent slope dressing.

C. & E. M. Photo

Both Lane and Kelleher used tractor-scraper outfits for dirt-moving up to 1,000 feet. This LeTourneau LP 12-yard scraper being pulled by a Caterpillar D8 was rented by Kelleher from N. D. Maselli Corp.

The principal structure on this con-

(Continued on next page)

THE STRONGEST GEARED POWER FOR ITS WEIGHT IN THE WORLD

ALL STEEL HAND HOIST

SEATTLE, U.S.A.

The Biggest Little Hoists in the world for use where power is not practical, available, or sufficient.

2-Ton "Lightweight"	75 ft.	1/4"
5-Ton "General Utility"	250 ft.	1/2"
15-Ton Triple-Geared "Special"	1200 ft.	7/8"

With patent gear change and positive internal brake that never fails, and will lock load.

Gear Ratio	Weight	Price
2-Ton 4 & 22 to 1	60 lb.	$ 50
5-Ton 4 & 24 to 1	110 lb.	75
15-Ton 4, 19 & 109 to 1	680 lb.	250

BEEBE BROS.

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Dealers in all Trade Centers

LOOK

HOW CLEVELAND WAGON DRILLS WILL SPEED YOUR JOBS!

DRILL AT ANY ANGLE...The DR30 will drill flat holes from 4" to 8' above ground, plus straight up or down *or any direction.*

LARGE FEED CAPACITY...Over 8' permitting 6-foot steel changes; the DR30 handles depths to over 25'.

RECOIL DEVICE SPEEDS YOUR DRILLING...It holds machine to the work and cuts drilling time from 10 to 25%.

FORWARD LEG POINT holds the drill and steel in line whether operating in down, flat or angle holes.

CENTRALIZER KEEPS STEEL FROM "WALKING" ... When starting hole the centralizer on the DR30 holds the steel in place, preventing breakage of bit points.

EASY MOVEMENT OF U-BAR...The twin jack-screw mechanism permits easy moving of U-bar, and also shortens set-up time.

MAIN WHEELS SWIVEL 90° for line drilling, and 180° in order to obtain narrower tread.

• *Write for Bulletin 132*

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Branch Offices and Distributors in Principal Cities and Mining Centers.

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Leaders in DRILLING EQUIPMENT

Heavy Grading Needed For Highway Relocation

(*Continued from preceding page*)

tract is a 3-center-arch reinforced-concrete culvert built over Crow Hill Brook near the north end of the job. From coping to coping the structure measures 103 feet and has a rise of 7½ feet. The mass footings are not reinforced as is the arch, which is 15 inches thick at the top and 2 feet 10 inches at the spring line. Over the top of the arch the fill is 25 feet high.

Record of Work

The Lane Construction Co. set up its field headquarters in Baldwinsville in an empty store which it rented. There it kept on wall charts an accurate record of progress from the very first yard of dirt that was moved. These charts, compiled on 10 x 10 cross-section paper, included: (1) mass diagram for earth movement; (2) block diagram for progress; (3) record of daily output for each piece of equipment.

In the first chart, showing the movement of material, the distance was laid out on a horizontal scale of 1 inch equals 200 feet, while the vertical scale was 1 inch equals 10,000 cubic yards. In the upper part of this diagram the earth-work quantities were laid out in rectangles with the cuts drawn above the horizontal zero axis and the fills below. This was a typical earth-work profile. It showed at the start of the job just how much cut and fill were to be done and at what locations. Below and to the same scale was another diagram, but this time drawn on a curve. On this, earth movements for the entire job were worked out in advance, before even a shovelful of dirt was excavated. Tables underneath the profile curve indicated, for instance, to between what fill stations the cut between certain stations was to be moved, and whether scrapers or shovels were to be used for the work. Here also were indicated the locations where borrow material was necessary, where it was to come from, and what type of equipment was to be used in moving it. No haphazard, hit-or-miss type of work here, but a fully planned method of operation.

On the next chart, which showed the progress of the different operations, the various drainage structures were sketched in black pencil along a horizontal line representing the center line of the road. Thus all construction of this type included in the contract could be seen at a glance. As each portion of the work was completed—for instance the barrel or headwall of a culvert—it was blocked out with red pencil. Above the structure line were other horizontal diagrams, one above the other; these were marked: grading, 12-inch gravel sub-base, 3½-inch base, 2½-inch top, etc. On these too progress was marked out in red. In this way the status of all phases of the contract could be ascertained at a glance.

The third chart, which contained a record of the daily output of each piece of earth-moving equipment, had a column on the left for remarks about such data as rainfall and the time it occurred. To the right of this was the date column. Then under the heading of scraper excavation were three columns for all possible hauling distances: the first from 0 to 500 feet, the second from 500 to 1,000 feet, and the third for 1,000 feet and over. Two columns at the right contained total yardage figures, one for the day and the other for a running total covering the job. A section below this was devoted to equipment loaded by shovel, with three different haul-distance columns: 0 to 1,000 feet, 1,000 feet to ½ mile, and from ½ to 1 mile. Additional sections were allocated for scraper and self-propelled units to indicate their performance on roadway borrow material and on gravel hauling.

With the aid of such detailed charts the contractor's superintendent always had his finger on the pulse of the whole job. He could plan his work well in advance, and distribute his equipment and crew of 50 to the best advantage for efficient operation.

Kelleher Contract

On the upper section of the project north of Baldwinsville, the Kelleher Corp. used both tractor-scraper units and shovel-loaded trucks for moving the dirt. At the start of the job three LeTourneau LP 12-yard scrapers pulled by Caterpillar D8 tractors were in use, with another such unit added shortly after. Hauls with the scrapers averaged between 500 and 800 feet. For the longer

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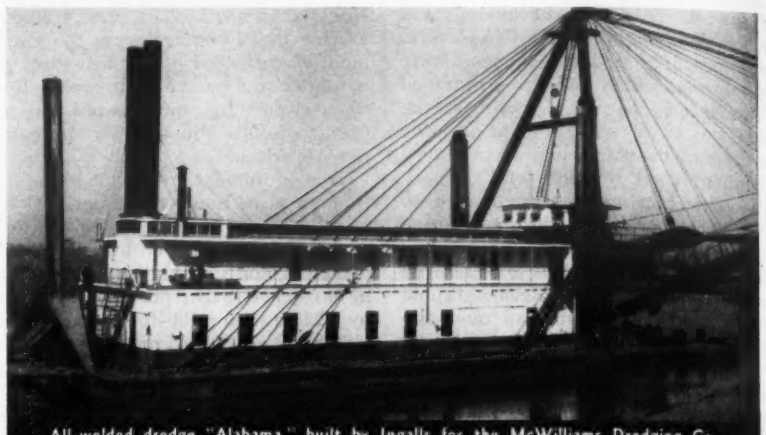

All-welded dredge "Alabama," built by Ingalls for the McWilliams Dredging Co., Baldwin, La.

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Above trailer with actual 600 ton capacity, was built for Eichleay Engineering Corp., and sold by Atlas Equipment Co., both of Pittsburgh, Pa.

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and to the solution of their problem of transporting a 300 ton burden in conjunction with a SECRET military test.

In the face of unprecedented problems, Rogers designed, built and delivered in 30 days, a trailer 39 feet long and 17 feet wide.

Sixty-four 14.00"x 27" tires, mounted in banks of eight on axle units, permitted full oscillation, conforming with uneven desert terrain and equal load distribution over all tires.

EXPERIENCE *builds 'em*
PERFORMANCE *sells 'em*

ROGERS BROS. CORPORATION
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Uncle Sam Says

The raising of the flag is always a wonderful thrill. This statue of the scene on Mount Surabachi which now stands across from the Navy Department in Washington, D. C., our nation's capital, recalls the back-the-attack spirit and your deeds as a wartime bond buyer. My slogan for you today on the first peacetime Flag Day since 1941 is "Now Back Your Future." Continued investment of part of your earnings in savings bonds is consistent with devotion to the flag. Old Glory symbolizes the security which savings bonds assure.

U. S. Treasury Department

C. & E. M. Photo

When peat deposits were encountered, the Kelleher Corp., contractor for 3.7 miles of new road, used a Northwest crane with a 35-foot boom and a ⅝-yard clamshell.

Heavy Grading Needed For Highway Relocation

(Continued from preceding page)

hauls averaging 1,000 feet, trucks were employed, usually on an hourly rental basis. A Lorain 80 2-yard shovel loaded three Sterling 5-yard trucks from one cut section, while another Lorain, a 1½-yard model, loaded two Mack 5-yard trucks on another part of the job. A D8 tractor worked with the scrapers as a pusher. Two other tractors, a D6 and an Allis-Chalmers HD-10, with dozers leveled off the dumped material. Where peat was encountered in shallow deposits it was removed with two other tractor-dozers, a D7 and an RD8, which were also used for leveling and scraping. When the deposits of peat were deeper, a crane with a Haiss ⅝-yard clamshell was used in its excavation.

When borrow was needed, it came from roadside pits within 1,000-foot hauling distance. Fills were compacted by Buffalo-Springfield smooth-wheel rollers, two 12-ton 3-wheelers, and a 15 to 21-ton tandem. The earth fills were compacted in 1-foot layers, while the gravel was laid and rolled in 6-inch layers. An average of about 4,000 yards of material was moved in an 8-hour day. Scrapers handled 60 per cent of that figure, shovels and trucks the remaining 40. The crew ranged between 60 and 70.

Included in this contract was a reinforced-concrete arch bridge over Beaman's Pond Brook. It has a 15-foot span, with the ring 12 inches thick at the top and covered by 3 feet of fill.

Grade Separation

The M. DeMatteo Construction Co. started work April 1, 1946, on the bridge over the B & M 2-track line. It has three spans for a total length of 175 feet, and is supported on two concrete abutments and two concrete piers. It is built on a 35-degree skew, with 18 feet 8 inches minimum headroom at the center span which has a horizontal clearance of 29 feet 6 inches. The superstructure is supported on ten steel stringers, 33-inch WF 125-pound continuous I-beams, with diaphragms of 27-inch WF 91-pound I-beams set on 14-foot centers. The webs of the beams are encased in 1½ inches of Gunite, while a 2-inch layer is put on the flanges. Into the Gunite at the bottom of the stringers, ¾-inch wrought-iron blast plates are secured along the middle span to prevent corrosion of the steel by locomotive vapors from below. They are held in place with 15/16-inch plug welds on 12-inch centers. The bridge deck is a 6½-inch concrete slab.

Items and Personnel

The major items included in the two road contracts are as follows:

Item	Lane	Kelleher
Clearing and grubbing	13 acres	34 acres
Roadway excavation	141,500 cu. yds.	51,000 cu. yds.
Peat excavation	46,000 cu. yds.	9,400 cu. yds.
Ordinary borrow	121,000 cu. yds.	73,000 cu. yds.
Gravel borrow	12,400 cu. yds.	29,000 cu. yds.
Crushed-stone base course	3,450 tons	9,700 tons
Crushed-stone macadam surface	3,150 tons	8,450 tons
Bitumen for macadam surface	50,000 gals.	134,000 gals.
Cement-concrete masonry	784 cu. yds.	645 cu. yds.
Steel reinforcement	10,200 lbs.	7,200 lbs.
Reinforced-concrete pipe, 12-inch up	710 lin. ft.	3,270 lin. ft.

The Lane Construction Co. is represented by E. A. Gordon, Superintendent, and M. E. Evans, Office Manager. A. E. Page is District Engineer for the contractor in that territory. For the Kelleher Corp., F. E. Cassidy is Superintendent. The project is in District 3 of the Massachusetts Department of Public Works of which M. J. Dalton is District Engineer with headquarters at Worcester, and F. W. Guerin is District Construction Engineer. W. H. Mork is Resident Engineer on the Lane contract, and G. L. Esper on the Kelleher contract. For the U. S. Engineers, J. Wrisley is Resident Engineer and C. H. Lovejoy, Chief of Operations at Providence, R. I.

Stone Breaker, Pulverizer

Cubical or pulverized stone is produced by the Eagle impact breaker and pulverizer, described in a bulletin just issued by the Eagle Crusher Co., Inc., Galion, Ohio. The machine is built in two sizes, one having a feed opening for 12 x 16-inch material, and the other for 12 x 24-inch. The unit can be used both for crushing stone and for pulverizing cinders to be distributed over icy highways. Copies of the descriptive folder, Form 1043, are available on mention of this magazine.

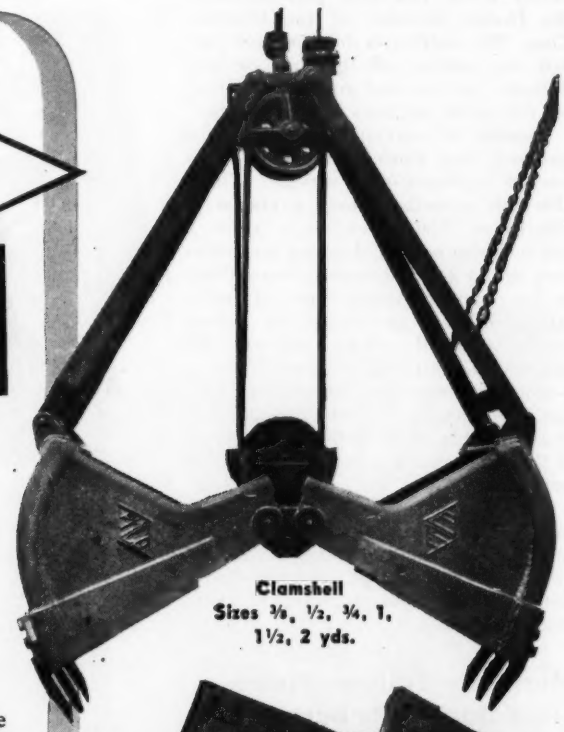
For 69 Years Builders of Fine WHEEL BARROWS:
AMERICAN
STEEL SCRAPER CO.
Sidney, Ohio
Watch for Post-War Models

PMCO
America's Most Complete Line of Material Handling Buckets
All purpose-
• SHOVEL
• PULLSHOVEL
• DRAGLINE
• CLAMSHELL

• FRONTS, BOTTOMS, SCOOPS and TEETH are 14% manganese steel developing tensile strength up to 120,000 p.s.i. This high percentage manganese steel gives tough, rugged strength for hard service and allows wide set corner teeth for easy entrance in digging. Volume production methods enable us to build a better bucket with amazing economies in manufacturing.

On the ½ yd. and ¾ yd. Shovel, Pullshovel, and Dragline Buckets, all teeth are interchangeable — a great advantage to operators.

Experience Counts
See your shovel man or equipment dealer about PMCO Buckets and Dippers.


Clamshell
Sizes ⅜, ½, ¾, 1, 1½, 2 yds.

Pullshovel
Sizes ⅜, ½ and ¾ yd.

Dragline
Sizes ⅜, ½, ¾, 1, 1½, 2, 2½ yds.

Shovel
Sizes ⅜ to 18 yds.

"Quality Since 1880"
PETTIBONE MULLIKEN CORP. CHICAGO 51, U. S. A.
WE OPERATE THE LARGEST AND MOST COMPLETE MANGANESE STEEL FOUNDRY IN THE UNITED STATES.

The new 1-ton Dodge Power-Wagon for general heavy-duty service is an adaptation of the four-wheel-drive Dodge military unit of which 255,195 were built during the war.

Utility 1-Ton Truck For Rigorous Duties

Adapted for civilian use from the four-wheel-drive military vehicle used to such great extent during the war, the Power-Wagon, a 1-ton general-utility truck, has been announced by the Dodge Division of the Chrysler Corp. The vehicle is designed for rugged duty, either off the road or over difficult, unimproved roads, as well as for use as an auxiliary power source.

Capable of carrying a 3,000-pound payload, the Power-Wagon is engineered for heavy-duty service. With a 126-inch wheelbase and a choice of 9.00/16 or 7.50/16 eight-ply tires. it has a 94-hp engine, 4-speed transmission, and a 2-speed transfer case. Power for operating many types of auxiliary machinery is supplied by a dual power take-off, which delivers 536 rpm at the tail shaft. It will drive a 9-inch-diameter belt pulley at a 3,124 fpm belt speed. A winch, with 250 feet of steel cable, is mounted on the front of the truck, and can handle up to 7,500 pounds.

More complete specifications and details on the Power-Wagon can be obtained by writing the Dodge Division at 7900 Jos. Campeau St., Detroit, Mich., and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Morrissey Follows Mabie As Atlas White Bureau Mgr.

Patrick F. Morrissey has been named to succeed Floyd L. Mabie as Manager of the Atlas White Bureau of the Universal Atlas Cement Co., New York.

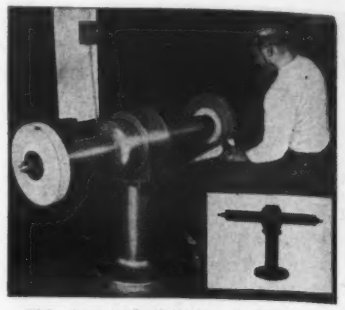
Mr. Mabie, Manager of the Bureau for the past nine years, has resigned after eighteen years' service with Atlas to become President of a concrete-products manufacturing concern in Greensboro, N. C.

His successor, Mr. Morrissey, joined Atlas in 1939. He served two years as a Naval officer in the Pacific theater during the war, and returned to Universal Atlas last February as representative of the White Bureau in the Kansas City area.

Buffer-Grinder Has Wide Shop Utility

Although originally designed for use in blacksmith shops as a grinder and buffer of plow shares and similar unwieldy objects, a new low-pedestal-type buffer-grinder made by the Hobart Brothers Co. has been found adaptable to a wide variety of other jobs.

Sturdily constructed from electrically welded steel, the grinder-buffer is powered by a 3-hp motor. A starting switch is located on the pedestal, under the motor, close to the operator's hand. The motor has a 1,750-rpm speed. Single-phase motors are repulsion-induction, and three-phase units are squirrel-cage induction. Between the wheels and the low design of the pedestal there is more than 40 inches of working space. This enables the worker to sit and brace the workpiece between his knee and the buffing wheel, Hobart says.



This low-pedestal-type buffer and grinder is designed for use in state and county highway department and contractors' shops.

Full details on this buffer-grinder can be secured by mentioning this news item. Write the Hobart Brothers Co. at Troy, Ohio.

KINNEY

BITUMINOUS DISTRIBUTOR

Rotating Plunger Pump in Kinney Distributor has large capacity which permits faster loading, faster application and faster road speed. Accurate as a meter, pump handles all grades of bitumen used in road work. Safe to operate, easy to maintain. Order now.

Write for catalog

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NEW YORK CHICAGO PHILADELPHIA
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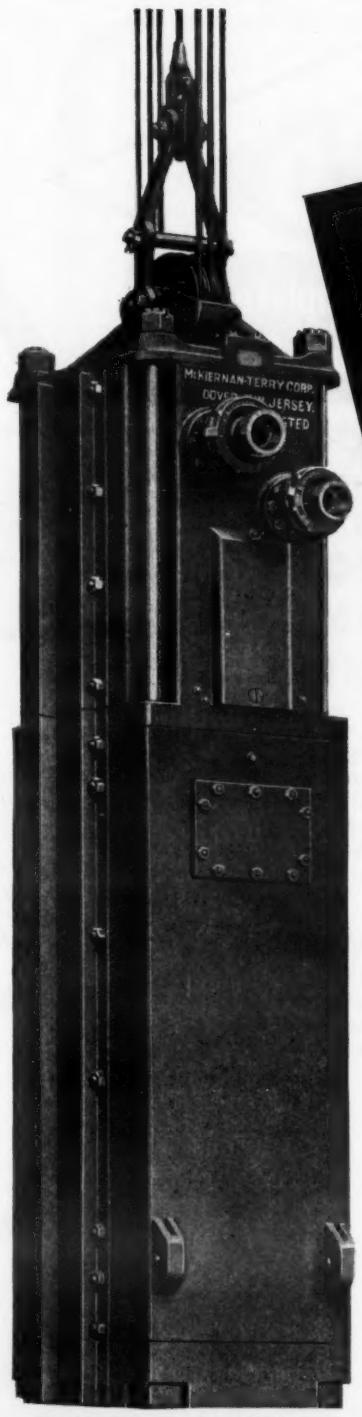
We also manufacture Vacuum Pumps, Liquid Pumps and Clutches.



Size S14 McKiernan-Terry Single-Acting Pile Hammer, total weight over 14 tons.

BLACKSMITH HAMMER BULLETIN
Describes McKiernan-Terry Blacker Hammer, which combines electric motor-driven power hammer with blacksmith's anvil in a co-ordinated unit, that enables one smith alone to handle work of a smith and two helpers. Saves time and labor, increases output. Ask for free Bulletin No. 56.

THIS HAMMER DRIVES HEAVY MASS PILES THROUGH DENSE SUBSTANCES

Where soil to be penetrated offers unusually severe resistance, or when heavy mass piles, such as pre-cast concrete, are to be driven, choose McKiernan-Terry Single-Acting Pile Hammers to handle the job efficiently and economically.

The heavy blows of these hammers, delivered at lower velocity at point of impact than with double-acting hammers, overcome inertia and friction without over-strain on the piling. Their very heavy rams, with large striking area, distribute the blow, increase its effectiveness and reduce wear on ram and anvil block.

When contractors encounter blue clay, heavy "gumbo", incipient shale, hard pan or compacted gravel, McKiernan-Terry Single-Acting Hammers provide the solution. The *only* single-acting hammers that will operate under water. Five standard sizes available, with striking energy ranging from 9,000 to 37,500 foot-pounds per blow.

The enlarged facilities of two modern McKiernan-Terry plants offer contractors prompt service in securing single- or double-acting pile hammers, as well as hoisting and marine auxiliary equipment of many types and specially engineered and designed machinery.

WRITE FOR ILLUSTRATED BULLETIN

Get full information in new, free McKiernan-Terry Bulletin No. 57. Gives diagrams, specifications, operating notes, concise listing of features, advantages, savings. Your copy will be sent promptly on request.

MK-1008

McKiernan-Terry CORPORATION
Manufacturing Engineers
19 PARK ROW NEW YORK 7, N. Y.

U. S. Engineer Board Displays War Secrets

Exhibit for Science and Industry Held at Fort Belvoir, Va., Includes Captured Enemy Equipment

✦ AFTER being closed to visitors for nearly 5 years, the gates which shut off a section of the U. S. Army's huge Fort Belvoir, Virginia, encampment were thrown open in April. Representatives of science and industry were invited in to view some of the wartime developments of the Engineer Board. The exhibit also included a collection of captured enemy equipment, and each piece was displayed with its American counterpart for purpose of comparison. The exhibit enabled engineers, scientists, and manufacturers to inspect existing U. S. and foreign equipment with a view to further development. For the first time since late in 1941, the entire laboratories, research facilities, and testing equipment of the Engineer Board were opened for inspection and review by other than military personnel.

The exhibit included construction equipment; survey, mapping, and photogrammetric equipment; electrical and electronic apparatus; water - supply equipment and distillation units; bridging equipment; demolition devices; and many other types of equipment. Fort Belvoir also contains the laboratories devoted to electrical engineering, photolithography, radiation, electronics, weather and temperature testing, and materials. Moreover, model and diorama shops were on its "open-house" list.

Construction Equipment

Along with a representative assembly of American mechanical equipment in earth-movers, tractors, welders, augers, and compressors, the exhibit displayed such captured German items as an electric hammer drill, a combination blowtorch and soldering iron, a portable mortising tool, and a 200 and a 300-ampere arc welder. An outstanding feature of these welders is the almost complete interchangeability of parts between the 300 and the 200-ampere units.

The German piece of equipment that attracted most attention was a 10-ton gasoline-electric crane, full-rotating type, and mounted on a three-quarter-track vehicle. The power unit consists of a 12-cylinder, V-type, gasoline engine that, through transmission, drives the tracks providing motive power. A power take-off is used to drive the generator, from which the power necessary to operate the crane is obtained. It incorporates a variable counterweight, cylindrical in shape, which can be filled with sand or gravel, and a counterweight boom along which the counterweight can be extended to increase the lifting capacity to a maximum of 10 tons. The load boom is collapsible, breaking into three 8-foot sections of heavyweight tubing, which are mounted on the side of the unit when not in use. The A-frame peak can be lowered to allow better overhead clearance. Each set of bogie wheels can be locked into position to permit rigid suspension and to eliminate the characteristic springing action.

From the Japanese, a 6-cylinder diesel tractor-dozer was displayed along with a hydraulic rooter, a couple of pile hammers, and two air compressors. Equipment of a similar category was captured from the Italians, together with a 39-inch-capacity chain saw.

Surveying and Mapping Equipment

The survey, mapping, and photogrammetric equipment included a complete display of Carl Zeiss instruments featuring the Stereoplanigraph. The latter German instrument is one of the most universal and elaborate photomapping instruments ever constructed. It is used for plotting topographic maps from stereoscopic photography, and for aero-triangulation from aerial strip photography. This instrument accommodates photography of any tilt perpendicular to the line of flight, and is equipped with projection cameras of 100-mm and 200-mm focal lengths.

For military surveying the Army formerly used the German-made Tavistock and Wild theodolites, but these were no longer available after the war started. Even before that time, the Corps of Engineers had recognized the need for developing manufacturing facilities for this type of instrument in the United States, and steps were taken to secure pilot models from American surveying-instrument makers. Satisfactory models of these precision instruments were constructed by both the W. & L. E. Gurley Co. of Troy, N. Y., and the Keuffel & Esser Co. of Hoboken, N. J., and the Gurley instruments were in quantity production at the end of the war.

The development of these precision theodolites was initiated by the Corps of Engineers, and the pilot models were constructed under development contracts of the Engineer Board. The successful development of the instruments, previously obtainable only from foreign sources, now means a source of supply for civilian use in the United States.

Millions of maps had to be made for the invasion of Europe, and the instrument the Corps of Engineers relied on for producing those maps is known as the multiplex projector. By the time the final preparations for invasion had been made, the maps were ready, and our troops went ashore with up-to-date, accurate maps of the area they were attacking.

(Concluded on next page)

Engines FROM 90 to 215 HP. Generators FROM 60 to 115 KW
More Power
MURPHY DIESEL
More Profit
MURPHY DIESEL COMPANY, 5319 W. Burnham St., Milwaukee 14, Wis.

AT Koehring, where the world's first paver was built, we know the importance of keeping a paving job on schedule, "in the money". We know what just one hour's delay can cost. That's why the Twinbatch combines high maximum production — almost 90 batches per hour, enough concrete to lay down a 1,000 foot slab, 20 feet wide, in four hours — with exceptional Heavy-Duty strength.

HEAVY-DUTY PAVER

Because it's built right for on schedule service, the Twinbatch is a Heavy-Duty machine. Every detail tells a Heavy-Duty story: 16-inch 78-lb. steel I beams make up the main frame. The heavy two-compartment drum has extra alloy liners. Drum roller paths are the heaviest and thickest of any paver.

CONTINUOUS EFFICIENT SERVICE

Because maximum efficiency is safe-guarded by Heavy-Duty construction, high production continues uninterrupted. Unfailing, the Twinbatch sets an efficient, money-making pace for the crew. At the customary 60-batches-an-hour clip, the Twinbatch works smoothly, effortlessly . . . easy on the operator, easy on the crew. When rains cause delays, its top output of 86.7 batches per hour gets the job back on schedule — fast.

KOEHRING 34E twinbatch PAVER TWO COMPARTMENT DRUM

KOEHRING COMPANY • Milwaukee 10, Wisconsin

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

U. S. Engineer Board Displays War Secrets

(*Continued from preceding page*)

Demolition

One of the features of the demolition exhibit was a blast-driven earth rod which, when removed, leaves a hole about 6 feet deep by 1½ inches in diameter. This hole can then be enlarged by the use of a multiple-strand detonating fuse or by the use of a special springing charge supplied with the set. In test operations two men blasted a 12-inch hole 6 feet deep in clay and gravel soil in 20 minutes. In comparison, a power earth auger required 45 minutes to dig a hole of the same size. The earth rod is especially suitable for digging holes for use in cratering charges, bridge-abutment demolitions, and for telephone poles and log obstacles.

Engineer Board

The job of the Engineer Board is to adapt commercial engineer equipment for the arms and services of the Armed Forces of the United States, to fit these tools for military use in any part of the world, to develop new tools for special uses, and to evolve methods for putting these tools to work. Much of this equipment and many of the methods developed by the Engineer Board can be applied directly to peacetime industrial tasks.

Lieut.-Gen. Raymond A. Wheeler, Chief of Engineers, U. S. Army, is in command of Fort Belvoir, Va., while Col. James C. Marshall, CE, is President of the Engineer Board.

Air-Compressor Line Serves Garage Needs

Highway-department shop superintendents, and those charged with maintaining contractors' equipment, will be interested in a line of service air compressors. Produced by the Gilbert & Barker Mfg. Co., the Gilbarco line features single and two-stage models designed to meet most depot and service-station needs.

Supplied in capacities of 1.8 to 20.6-cubic-foot displacement per minute, these compressors can be used to power such air equipment as car lifts, gasoline pumps, greasers, paint guns, car washers, tire inflators, etc. There are 28 different models in the Gilbarco line. Of these, 12 are single-stage units, while the balance have two cylinders for two stages of compression.

Electric motors in sizes from 1/3 to 5 hp drive these compressors, but gasoline engines are available with a number of the sizes. Air-tank capacities for the Gilbarcos range from 20 to 80 gallons. Vertical tanks, which take up less floor space, are found in two single-stage models, and in five two-stage units. The pressure range for these compressors varies from 120 to 200 pounds.

The features of Gilbarco compressors are detailed in a 16-page booklet available from the manufacturer. Readers who mention this notice can obtain the catalog, Form P-262C, from Gilbert & Barker, West Springfield, Mass.

Film of Foam Fights Flaming Shop Liquids

Because fire is an ever-present menace, much effort has been expended by modern industry to devise effective means for combating types of fires peculiar to our mechanized civilization. One of these developments is Air Foam, used to fight fire particularly in oil and other flammable liquids. How this compound that smothers fire was developed, what it is, and some graphic details as to its effectiveness are given in a new brochure.

The illustrated booklet describes Air Foam's blanket action on large-scale open-air fires as well as on those inside such places as contractors' and highway departments' shops. Utilized as permanent applications, or as portable attachments to the water hose, Air Foam playpipes are said to have greatly increased fire-fighting efficiency.

Copies of Form AD 323, the booklet on Air Foam, are available on request. Mention this news item when writing the Pyrene Mfg. Co., 560 Belmont Ave., Newark 8, N. J.

Gar Wood Plant Manager

Ross Miller, who joined Gar Wood Industries, Detroit, Mich., as a mechanic almost 26 years ago, has been named Manager of the Pacific Coast factory at San Francisco, the firm has announced. Recently Manager of the Philadelphia branch, he has also been National Service Manager, and has held sales posts in New York and the middle west.

Where roads look better, are safer and cost less to maintain—look for
TUTHILL GUARDS
TUTHILL Guard makes roads safer, look better and cost less to maintain. Strong steel, convex panels are cut to convenient lengths for quick, easy, economical installation. Rounded end pieces finish the job—make it look neat, attractive. Built for visibility . . . safety . . . economy . . . TUTHILL gives it! Available for complete installation. Request details.
Pacific Coast Manufacturers and Distributors: U. S. SPRING & BUMPER CO., Los Angeles, Calif.
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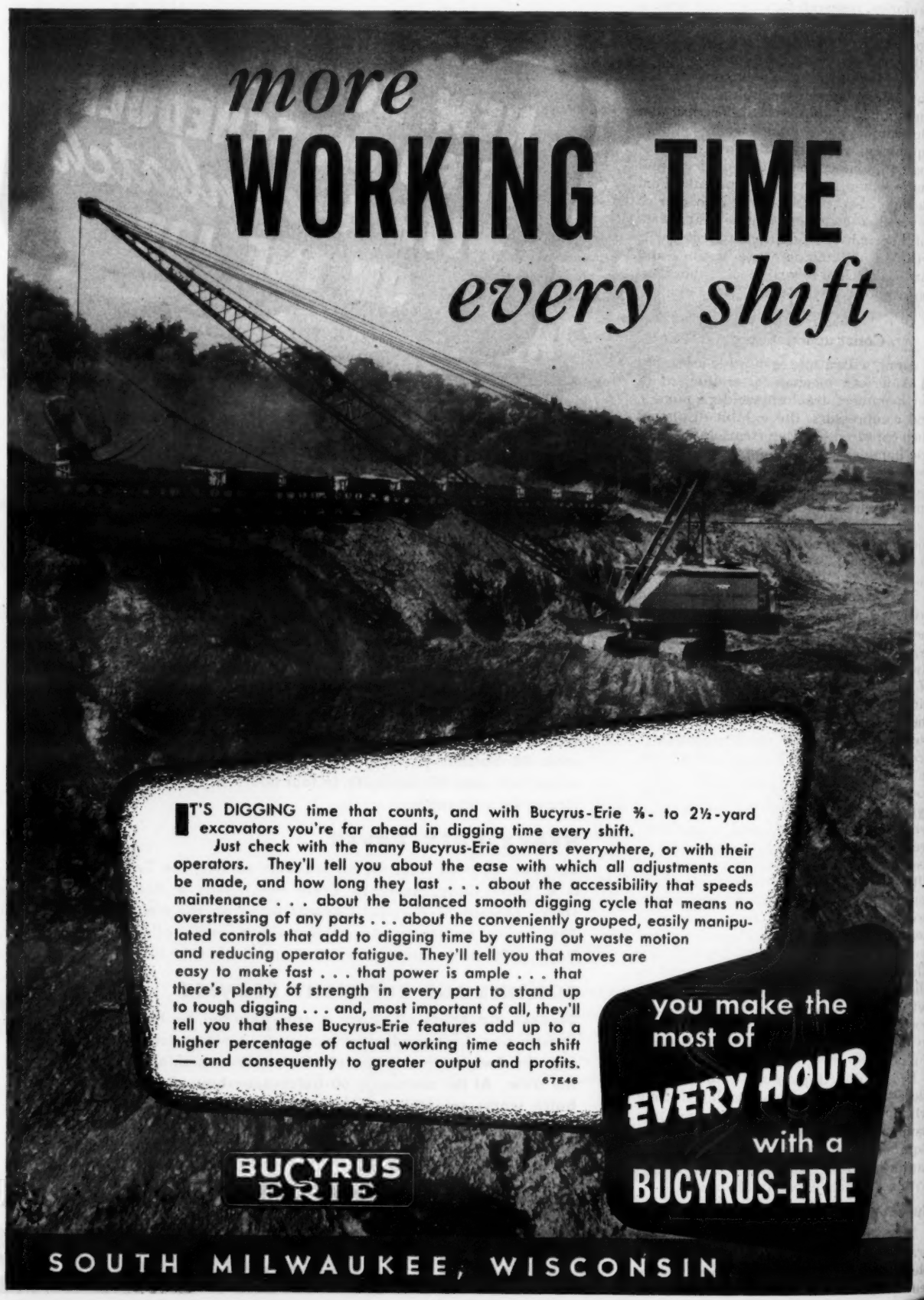
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WORKING TIME
every shift
IT'S DIGGING time that counts, and with Bucyrus-Erie ⅜- to 2½-yard excavators you're far ahead in digging time every shift.
Just check with the many Bucyrus-Erie owners everywhere, or with their operators. They'll tell you about the ease with which all adjustments can be made, and how long they last . . . about the accessibility that speeds maintenance . . . about the balanced smooth digging cycle that means no overstressing of any parts . . . about the conveniently grouped, easily manipulated controls that add to digging time by cutting out waste motion and reducing operator fatigue. They'll tell you that moves are easy to make fast . . . that power is ample . . . that there's plenty of strength in every part to stand up to tough digging . . . and, most important of all, they'll tell you that these Bucyrus-Erie features add up to a higher percentage of actual working time each shift — and consequently to greater output and profits.
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you make the most of
EVERY HOUR
with a
BUCYRUS-ERIE
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SOUTH MILWAUKEE, WISCONSIN

Levee Strengthened With Gravel Blanket

Material Replaced Along Land-Side Toe for Disposal Of Seepage Water; Part of Wabash River Program

✦ IN southwestern Indiana where the Wabash River is the boundary line between the Hoosier State and Illinois, a protecting levee on the east bank of that river is being improved and strengthened in a test area. The improvement consists of replacing existing material at the inside toe of the levee with pervious material which will permit percolation of seepage water through the levee without endangering the levee section. This new method of construction, employing a gravel blanket for a horizontal drain, is being used by the U. S. Engineers to strengthen the Gill Township levee, 6 miles west of Carlisle, Ind.

This levee was built between 1938 and 1941 by casting the material in place with draglines. It is not as solid and compacted as are levees built up with rolled fills; consequently there has been much seepage from the river side to the land side of the levee. Another factor contributing to this seepage was the use of pit-run material for the original levee construction. The area abounds in sand and silt which does not compact well, besides being pervious and conducive to seepage. Little or no clay was available either to put on the river-side slope of the levee as an impervious layer, or to blend with the material that was used. Still another source of worry, from the standpoint of flood control, is the high water table in this locality during floods, when water is found in the sandy, silty, gravelly material that lies only 2 to 3 feet beneath the layer of topsoil.

Gravel Blanket

The first step in the new design, as conceived by the U. S. Engineers to improve the dangerous sections of this levee, consisted of excavating from the land-side toe of the levee back to a point halfway between the toe and the levee center line. From this point the excavation line is to a 1 on 1 slope to meet the original land-side slope. A 2-foot layer of gravel was then spread over the exposed base of the levee, and was covered with backfill of the original material which was compacted as it was placed.

With this new horizontal gravel drain, whatever seepage water comes through the levee from the river side will be drawn down to the 2-foot layer of pervious material, and finally out beyond the land-side toe of the slope, where the water drains to pumping plants and is pumped over the levee. The gravel will prevent levee material from being carried along with this water; it will also prevent sloughing and weakening of the earth wall which frequently results when the land-side slope becomes saturated. This design also localizes the area where boils might develop and keeps them close to the land-side toe of the levee where they can be controlled.

Levee Contract

A contract for the reconstruction of a 10,000-foot section of the Gill Township levee was awarded by the U. S. Engineers to the Green Construction Co. of Oaktown, Ind. About 20 per cent of the levee cross section, beginning at the toe of the land-side slope, was removed by a dragline, which stockpiled the dirt behind the levee, forming a bank to be used later as a haul road. This earth-moving involved 73,000 yards of excavation.

Gravel was then dumped into this excavated section in a blanket 2 feet thick x 25 feet wide. Its purpose, as explained, was to act as a filter, comparable to a dry well or French drain, to take care of any seepage. A LeTourneau Angledozer was used to spread the gravel, and a pneumatic-tire roller made a few passes to seal it.

To meet the U. S. Engineers' specifications for end-dump hauling units that would not continually travel over and pack down the imported gravel, the contractor used two Tournatrailers as

(*Concluded on next page*)

The Green Construction Co., contractor for a 10,000-foot section of the Gill Township levee in Indiana, used two Tournatrailers loaded by a dragline to haul material from the borrow pit for the gravel filter blanket at the land-side toe of the levee.

● Here's the friction material that's setting new records for life and efficiency in the industrial field.

It's Ray-Metl (U. S. Pat. No. 2,369,502)—especially developed for the rugged requirements of heavier equipment. In the hardest type of service, in actual tests, Ray-Metl has averaged 50% more life (in some cases as high as nine times greater life) than the clutch facings it replaced.

Ray-Metl maintains the coefficient of friction—without fade—slipping no longer occurs. Changes in temperature and speeds have little effect. The face is grooved to scavenge out dirt—break the vacuum which retards positive disengagement.

It's more efficient, longer wearing, less costly. See your Raybestos jobber.

THE RAYBESTOS DIVISION of Raybestos-Manhattan, Inc.
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INDUSTRIAL
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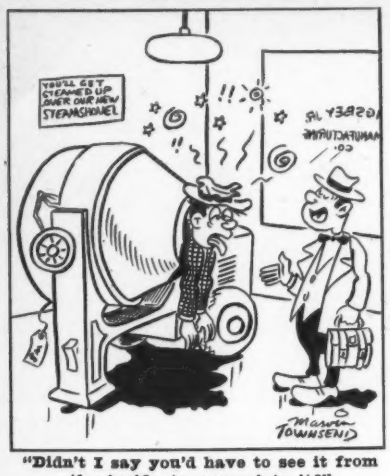


"Didn't I say you'd have to see it from the inside to appreciate it?"

Levee Strengthened With Gravel Blanket

(*Continued from preceding page*)

well as dump trucks to bring in the gravel from a near-by borrow pit, where they were loaded by a dragline. Because of limited right-of-way, the hauling units used the stockpiled dirt bank as a haul road; thus they never traveled over the deposited gravel blanket.

When the gravel hauling was completed, Carryall scrapers, pulled by Caterpillar tractors, and a dragline replaced the excavated levee material on top of the gravel bed, restoring the levee to its original form and cross section. The material was placed in 8-inch layers, spread by a bulldozer, and compacted by pneumatic-tire rollers. This work was completed in the spring of 1946.

Levee Maintenance

All the Wabash River levees, which have an average height of about 12 feet, were built by the U. S. Engineers, but they are maintained by the levee districts which they protect. Present methods of levee construction differ somewhat from those used on previous construction along the Wabash. Instead of using sand, silt, or gravel almost exclusively, and casting it in place with a dragline, some impervious clay or silt is obtained by the use of wider borrow pits to blend in with these other materials. The pervious and impervious materials are either mixed as they are deposited and rolled, or else they are laid in alternate 8-inch layers, such as sand, silt, and clay, to be compacted and therefore somewhat mixed by sheepsfoot rollers.

The placing of this new gravel blanket on the Gill Township levee and others is expected to eliminate some of the costly steps that must be taken to protect the levees at high-water time. Some of these emergency maintenance methods include the placing of boards or brush both on the land-side slope and on the ground at the toe of the levee, and weighting them down with layers of sandbags. These are usually three deep at the foot of the slope, but they decrease up the bank to a single-bag layer until the line of saturation is reached.

Caring for sand boils that appear in the ground behind the levee is also a serious matter. They are caused by water percolating through or under the levee, and breaking out in a soft spot in the original ground or on the berm. When the water bubbles forth without being accompanied by levee material, the consequences are not so grave. However, if the substance of the levee is carried off with the water, then the flow from these boils must be checked to prevent possible sloughing with danger of levee failure.

This is done by stacking sandbags in a loop or ring around the boil to such a height that enough head is created to slow down the flow through the boil; finally no more material is displaced and the boil runs clear. No attempt is made to stop fully the flow of water from the sand boil, for if this were done a break-through would occur in some other location. These sandbag rings are usually four to six sacks wide, and are made large enough to clear the entire discharge area. They are built to a minimum height of 2 to 4 feet, with a spillway left at the top for the water to run off. When the sand boil is very close to the levee toe, the sandbag ring is tied in to the land-side slope of the levee.

Personnel

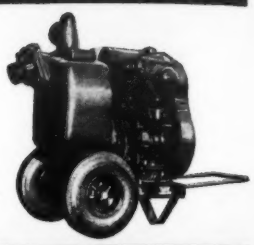
The levee improvement in the Wabash River basin is under the direction of the Louisville Engineer District, Louisville, Ky., where Col. Gilbert Van B. Wilkes is District Engineer. W. J. Brummette, of the Engineer Field Office at Vincennes, Ind., is Resident Engineer on this project.

Post-War Catalog of Jacks

Jacks of various types for a wide range of applications in the construction field are shown in a new 64-page catalog available from Templeton, Kenly & Co. The booklet features the Simplex line of lever, screw, and hydraulic jacks.

Hundreds of jacks of conventional and special types, in sizes from 3 to 100-ton capacity, are pictured and described in the pocket-size volume. Included are a number of items whose production was suspended during wartime, as well as some recent additions to the Simplex line.

Copies of the catalog, No. 45, can be obtained by readers of CONTRACTORS AND ENGINEERS MONTHLY on request. Write to the firm at 1020 So. Central Ave., Chicago 44, Ill., and mention this notice.

HUMDINGER
WRITE FOR NEW CATALOG No. 4503
SELF PRIMING CENTRIFUGAL PUMPS
Always dependable
Ruggedly built for heavy duty service
SIZES 1½" TO 10"

RALPH B. CARTER COMPANY HACKENSACK, NEW JERSEY

PLEASANT DREAMS

Every state or county highway engineer . . . every superintendent of streets . . . every contractor . . . every airport maintenance manager . . . can rest contented in the fact that HUBER Road Machinery is the answer to his dreams of low maintenance costs—plus a minimum outlay for equipment to do the job.

The HUBER MAINTAINER—"the one-man maintenance crew"—is 8 machines in one—a broom, mower, patch-roller, one-way or V-type snowplow, bulldozer, scraper, and lift-loader.

The new 3-wheel HUBER ROAD ROLLER is a versatile machine that gets jobs done in a hurry. It is built in sizes from 5 to 14 tons.

And . . . there's a new HUBER TANDEM for every type of work . . . from 3 to 12 tons.

Make your plans to standardize on HUBER Road Machinery—and make sure your dreams of lowest possible maintenance costs come true.

THE HUBER MFG. COMPANY • MARION, OHIO, U. S. A.
HUBER ROAD ROLLERS MAINTAINERS

Wheel-Bearing Service And Lubrication Manuals

Truck operators will be interested in two guides on how to service and lubricate wheel bearings. The booklets are issued by Standard Oil Co. of California. Each runs 24 pages and is bound in a handy jacket. One booklet treats wheel bearings in heavy-duty trucks and trailers; the other deals with those in passenger cars and light trucks.

"Make bearings last" is the keynote of the booklets. Their text tells why bearings fail, lists some warning signals, and urges prevention by maintenance. The step-by-step procedure of removing, checking, regreasing, and reinstalling the bearings is presented.

Copies of these valuable shop aids can be secured on request. Write the firm at the Standard Oil Building, San Francisco 20, Calif., and mention CONTRACTORS AND ENGINEERS MONTHLY.

Shovel-Crane-Dragline Features Illustrated

Twenty pages of text, photographs, diagrams, and specifications ably tell the story of the Lima 1201, which is readily convertible to a shovel, crane, or dragline. Copies of the new booklet, issued by the Shovel & Crane Division of the Lima Locomotive Works, Lima, Ohio, are available to readers of CONTRACTORS AND ENGINEERS MONTHLY on request.

The booklet features the application of "precision air control" in the 1201 machine, and describes the design advantages of the crawler truck, machinery base, main machinery, front end, and the cab. As a shovel, the 1201 has a capacity of 3½ cubic yards; as a crane, 65 tons; while as a dragline, its potential varies, depending on the boom length. Buckets of 2½ to 3½-cubic-yard capacities, with total weights up to 20,000 pounds, can be handled.

New Portfolio for C. I. T.

The C. I. T. Corp., which specializes in financing instalment sales in the machinery and construction-equipment fields, has acquired the instalment portfolio of the Credit Utility Co., Inc., and has taken over the servicing of its accounts. All C. I. T. facilities will be available to Credit Utility customers, through C. I. T. offices in New York, Chicago, San Francisco, and Los Angeles.

Meet the "IRON QUINTS"

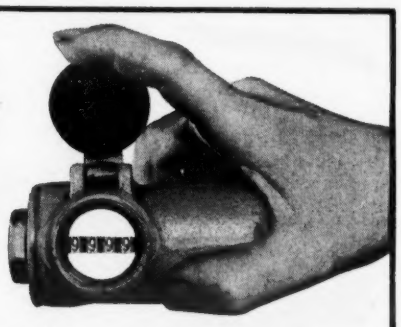
FIVE "Caterpillar" Diesel D8 Tractors started stripping anthracite coal at Plymouth, Pa., in the fall and winter of 1941. Up to March 15, 1946, the work records of the five machines, taken direct from their hour-meters, were as follows:

D8	1H9384	21,159 hours
D8	1H9236	21,733 hours
D8	1H9930	20,936 hours
D8	8R134	20,717 hours
D8	1H9730	22,485 hours

That adds up to a total of 107,030 hours of the toughest kind of work—ripping and bulldozing rocky overburden—loading and hauling 30-yard scrapers—climbing stiff grades—running in gritty mud and on slippery shale. Together, at a low estimate, the five units have moved 5,000,000 yards of earth and rock!

In the words of Paul Goddard, General Superintendent for Carey, Baxter & Kennedy, Inc., the owners—*"There's just nothing to compare a D8 with!"*

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS



Why does "Caterpillar" put an hour-meter on all its engines? Because the men who build those "Caterpillar" Diesels are willing to back the long life of their product against all comers.

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

The Dobbins portable fountain is designed to provide drinking water anywhere on the job.

Portable Fountain For Drinking Water

Drinking water for construction workers or maintenance crews can be provided in a new portable drinking fountain offered by the Dobbins Mfg. Co., Dept. 423, Elkhart, Ind. This fountain-style water tank has a built-in corrosion-proof bubbler of the tilting type concealed inside the fountain. The water-release knob is said to require only slight pressure to provide the desired flow for drinking. The tank carries 4 gallons, and has a hand pump equipped with a valve plunger to provide air for the necessary water pressure. Loops for carrying straps and a bracket for mounting a salt-tablet dispenser are among the other features.

Full details on this new drinking fountain are available from the manufacturer on request. Mention this notice.

New Chemical Cleans Concrete From Tools

Removing crusts of concrete from tools, forms, and other construction equipment has always been a time-consuming task. Costly and tedious hand chipping, scraping, and brushing has been wasteful of time and wearing on nerves. To overcome this situation, the Nox-Rust Chemical Corp. offers a chemical for removing such concrete formations which is said to remove rust as well.

The Nox-Rust concrete remover is a clear, yellowish, practically odorless liquid, said to be non-flammable and harmless to metal and wood. The tool or form is placed in this solution for about 3 hours. Most of the concrete dissolves completely in that time, while the remainder can be slushed off with plain water. Raising the temperature of the solution speeds removal. The solution can be used over and over again, Nox-Rust says.

Further details, and a Nox-Rust technical data bulletin on the new product, can be obtained on mention of this notice. Write the Nox-Rust Chemical Corp., 2425 So. Halsted St., Chicago 8, Ill.

Toncan-Culvert Group Recommences Activities

Harold J. Bair, President of the Empire State Culvert Corp., Groton, N. Y., was chosen President of the Toncan Culvert Manufacturers Association at the group's first national meeting since before the war. The association comprises representatives of fabricating companies which use Toncan iron, a product of Republic Steel Corp., for building culverts and other drainage products.

O. H. Miller, President of Choctaw, Inc. of Memphis, Tenn., is the Vice President of the Association, and N. J. Thompson, Sales Manager for the Thompson Pipe & Steel Co., Denver, its Secretary-Treasurer.

Current production problems and the development of new drainage products to meet the anticipated demand of highway and airport construction occupied the 3-day discussions at Cleveland. R. W. Langenbach, President of the Berger Metal Culvert Co., Somerville, Mass., heads a committee to study product development. His associates will be Mr. Thompson; Glen Busbee of Wisconsin Culvert Co., Madison, Wis.; Darrell Blake, Eaton Metal Products Corp., Omaha; and T. F. de Capiteau, Drainage Products Engineer for Republic Steel.

Barnes President Returns

Millard H. Pryor, President of the Barnes Mfg. Co., Mansfield, Ohio, has resumed active direction of the firm, which manufactures pumps. He has been on leave as a Commander in the U. S. Naval Reserve.

Truk-Loder Dumping dirt into hauling truck

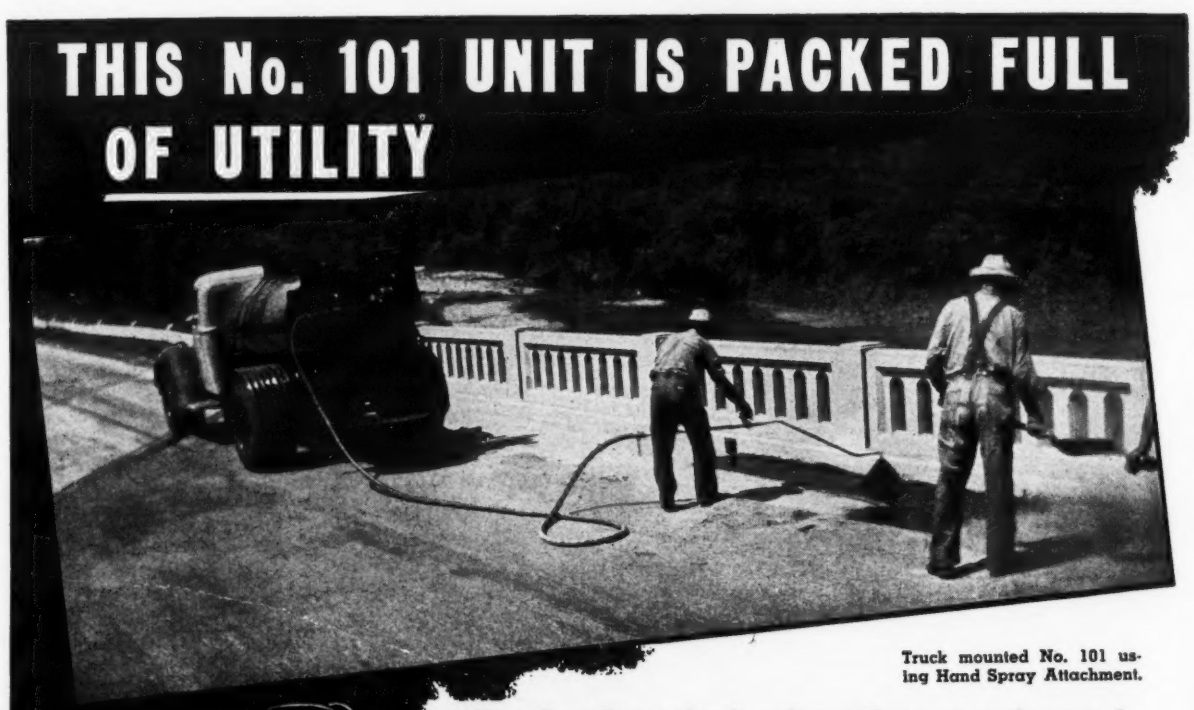
HANDLES LOOSE DIRT QUICKLY

For highway construction and maintenance. Surplus berm and ditch dirt are quickly and economically loaded.

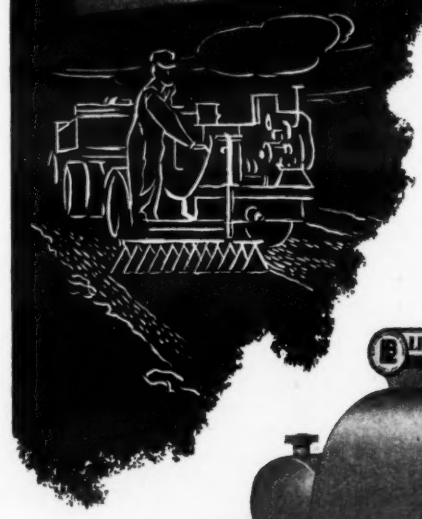
Hauling trucks can be loaded from either side or rear. Standard dump truck hoist furnishes lifting power. One-man operation. Bucket has ½-cu. yd. capacity. Write for prices and delivery.

TRUK-LODER COMPANY • Tiffin, Ohio

THIS No. 101 UNIT IS PACKED FULL OF UTILITY

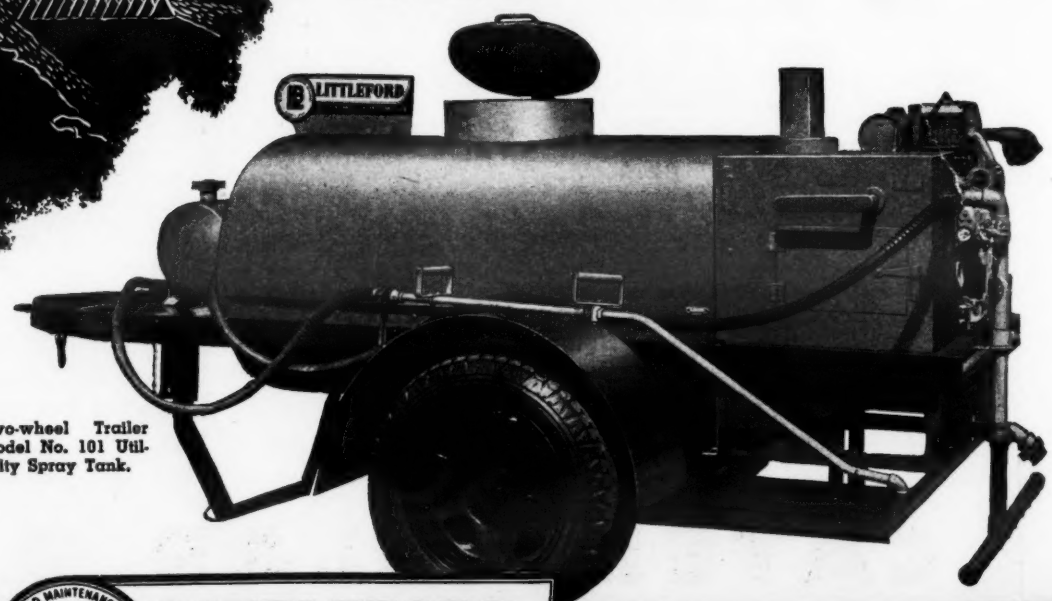


Truck mounted No. 101 using Hand Spray Attachment.



When those Streets, Roads or Airport Runways need repair, the Littleford Model No. 101 Utility Spray Tank is just the unit for the job. It's a combination of three units in one—has Spray Bar for small application work, Hand Spray for patch work and a Pouring Pot Outlet for crack filling work.

No. 101 will handle Asphalt, Tar, Cut-Back, Road Oils and Emulsions. For real *Utility* be sure to use a Littleford No. 101 Utility Spray Tank.



Two-wheel Trailer Model No. 101 Utility Spray Tank.

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County Maintenance Being Decentralized

Demand for Year-Round Open Roads Results in Use Of County Men and Machines On Township Routes

By HOWARD V. PEHRSON,
Central States Field Editor

✦ THERE is growing insistence upon year-round maintenance of township roads in Olmsted County, Minn., as a result of increased milk-truck traffic and the demands of the Consolidated School Districts in the rural areas. This is leading to decentralization of the county maintenance system.

"Right now we are in a state of flux," declares A. C. Leonard, County Highway Engineer. "Our original maintenance program was designed for the county highway system and was centralized at the county shop at Rochester. The increased demands, as a result of more and more traffic especially by the milk trucks in this dairy county, have resulted in bigger and bigger maintenance problems. We are called upon to provide both summer and winter maintenance on an ever-increasing number of township roads, as well as on State-Aid and County-Aid roads in the county. With equipment stationed at a central county location, there is too much dead-heading, so we are now planning an eventual system of several sub-garages, perhaps one for each two or three townships."

Just before the war, the Olmsted County Board of Commissioners, in an effort to meet mounting winter-maintenance demands, offered county operators and equipment on a cost basis to the townships, provided they agreed to summer maintenance on the same basis so that the operators might become familiar with the roads. At the outbreak of the war, roads of four out of the eighteen townships in Olmsted County were being maintained under this plan.

During the war, requests from additional townships had to be refused because of the shortage of men and machines, but this spring an additional five townships were accepted for the county-township year-round maintenance program. Under the plan, county-owned equipment and county operators are made available to the townships after routine work on the county road system has been completed. The county operators and equipment work under supervision by the town board of the township in which they are operating.

With 50 per cent of the townships already included, County Highway Engineer Leonard feels that it will be but a short time before very nearly 100 per cent of Olmsted County township roads are being maintained on a year-round basis.

"It will mean that we shall have to buy more equipment and employ additional operators," comments the Highway Engineer, "but it will simplify highway upkeep. And it will make possible the most economical method of maintaining all roads in the county when we know just how many townships are finally going to participate and just how many miles of township roads we are to maintain."

Two new Austin-Western 88 power graders spread crushed limestone for surfacing on Road O in Olmsted County, Minn.

Maintenance Is Big Business

Maintenance of highways, summer and winter, is the biggest phase of the Olmsted County Highway Department's activities. Throughout the year, the

(Continued on next page)

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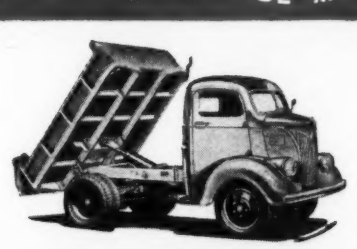
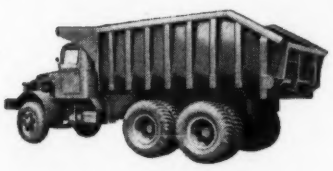
For years Gar Wood has consistently offered truck and trailer equipment of utmost utility and outstanding value. Leadership in this field resulted from this policy. Gar Wood equipment costs less in the long run because it is better built to give peak performance and lasting satisfaction.



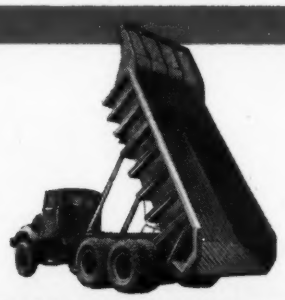
Type C12 Body and Model D6 or D7 Hoist. Dumping angle 55°.



Type X-112 Extra heavy duty Body with automatic downfolding tailgate.

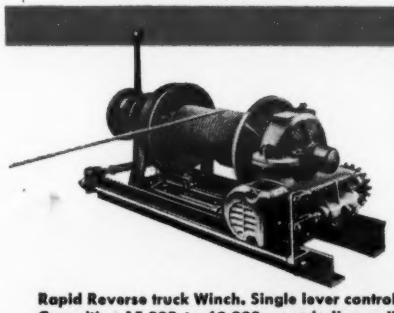
Special rock Body, scoop type rear end. Model F4CA cam and roller Hoist.

Type W12 Body. Model F4C cam and roller Hoist. Capacity 6 cu. yds.



Type X-112 Extra heavy duty Body, scoop end, with Model T-4440 Hoist. Capacity 19 cu. yds.

Type W12 Body, front recessed for Model TV83 Hoist. Capacity 15 cu. yds.



Rapid Reverse truck Winch. Single lever control. Capacities 15,000 to 60,000 pounds line pull.

West Coast Special W-12 Body, Model F8C cam and roller Hoist. Capacity 10 cu. yds.

Telescopic boom Crane. Radius 8 to 20 feet.

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County Maintenance Being Decentralized

(*Continued from preceding page*)

Department maintains 286.5 miles of State-Aid and 42.29 miles of County-Aid roads at an annual cost of more than $100,000, exclusive of new construction. This system of county roads breaks into the following classifications:

	State Aid	County Aid
Streamlined construction, rock or gravel-surface graded	105 miles	17.5 miles
Old standard, rock or gravel-surface graded	111 miles	17.9 miles
Bituminous surface graded to old standard	3.2 miles	.....
Concrete surface graded to old standard	.....	0.09 mile
Improved and surfaced, bitumin, gravel, or rock, but not graded to standard	60.8 miles	4.8 miles
Unimproved	6.5 miles	2.0 miles

Noteworthy in this tabulation is the large percentage of "streamlined" highways. Of the total of 328.79 miles of county roads, 122.5 miles or 37 per cent are of the streamlined type. The value of this type of construction, especially during the winter months when snow removal boosts maintenance costs on old standard roads, has been so clearly demonstrated that the town boards have adopted it almost entirely, even though it increases considerably the initial cost per mile of construction.

The streamlined highways in Olmsted County have a 24-foot shoulder-to-shoulder width. Shoulder slopes are 4 to 1 and, although the topography is generally rough and hilly, no backslope is steeper than 2 to 1. The average right-of-way is 66 feet with easements obtained from property owners for construction which may be necessary outside the right-of-way. Erosion on these streamlined roads is controlled by seeding and sodding both shoulder slopes and backslopes and by construction of paved gutters and ditch checks where necessary. Because limestone lies close to the surface throughout the county, almost all county roads are surfaced with crushed limestone.

Summer Maintenance

Routine summer maintenance in Olmsted County consists mainly of smoothing crushed-limestone surfaces with five Austin-Western 99 motor graders, two new Austin-Western 88's, and a Caterpillar No. 11 motor grader. Grass along shoulder slopes and backslopes is cut with a Case RI and two Case VAI highway mowers, and a John Deere LI highway mower. Since it has become next to impossible to hire men and teams when necessary, the County Highway Engineer has recommended that the County Board purchase two more mowers.

For additional summer highway and roadside maintenance and minor construction, the Department uses a Gardner-Denver No. 502 240-cfm compressor; a Rex 10-S mixer and a 2-wheel CMC 7-S mixer; and a Cemco Flat-Iron pneumatic-tire road roller.

During 1945, Olmsted County contracted for 14,172.2 cubic yards of crushed limestone for resurfacing, together with 1,816 cubic yards placed in stockpiles for future use. At the end of the year, there were 9,799.5 cubic yards of crushed limestone in stockpiles. All crushed limestone and gravel used in the county is purchased from commercial pits.

Some highways in the county are treated with asphalt or oil every year, and during 1945, the County applied 16,250 gallons of cut-back asphalt on village streets and on roads in the vicinity of Rochester, the county seat.

Winter Work

Maintenance of highways is a year-round proposition for the Olmsted County Highway Department, and there is only a short breathing spell in the autumn for the motor graders brought in from their summer maintenance assignments to be fitted with V-plows and wings in preparation for the battle against the drifts. Even as this preparation is under way, other county equipment is not idle. The four highway mowers are busy on the shoulder slopes and backslopes, cutting the weeds and brush so winter winds will blow the snow clear of the highway.

The 7-foot steel snow-fence posts are placed as soon as the farmers have completed the fall plowing—usually some time between the first and middle of November—and the 175,000 linear feet of lath snow fence is strung as soon afterwards as feasible.

Stockpiles of sand at the county yard at Rochester are prepared with 100 pounds of calcium chloride per cubic yard of sand. Such heavy use of calcium chloride is possible in Olmsted County because there is practically no pavement in the county and because, while the unit prices for crushed rock are 50 per cent higher than before the war, the cost of calcium chloride has remained at pre-war levels. The Department has considered it advisable in winter as well as summer to use more calcium chloride. During 1945, 1,200 tons were applied to county roads to conserve surfacing material.

When snowstorms strike, snow removal begins as soon as the wind goes down. On county roads, light speed plows open one track down the center of the highway. From this point on, no widening or winging is done. Two motor graders precede each Snogo, windrowing the snow with the regular moldboard. The Snogo then throws it clear of the roadway. About 90 per cent of the road mileage can thus be completely cleared with one pass of the rotary. In bad drifts where the snow is too deep for windrowing, the Snogo works ahead of the motor graders until the drift is cleared.

Olmstead County is well equipped to handle heavy winter snows. In addition to the motor graders previously mentioned, two of which are fitted with V-plows and wings for township work, the County owns a 5-ton Oshkosh truck with a Model TU3 Snogo; an Oshkosh 7½-ton truck with a TU3 Snogo; and an International-Coleman Model D40 truck with an LMU Snogo. Snow plows used include two Wausau X32WH V-plows for truck mounting; two Wausau B31W 1-way truck plows; and two Austin-Western plows with wings for

(*Concluded on next page*)

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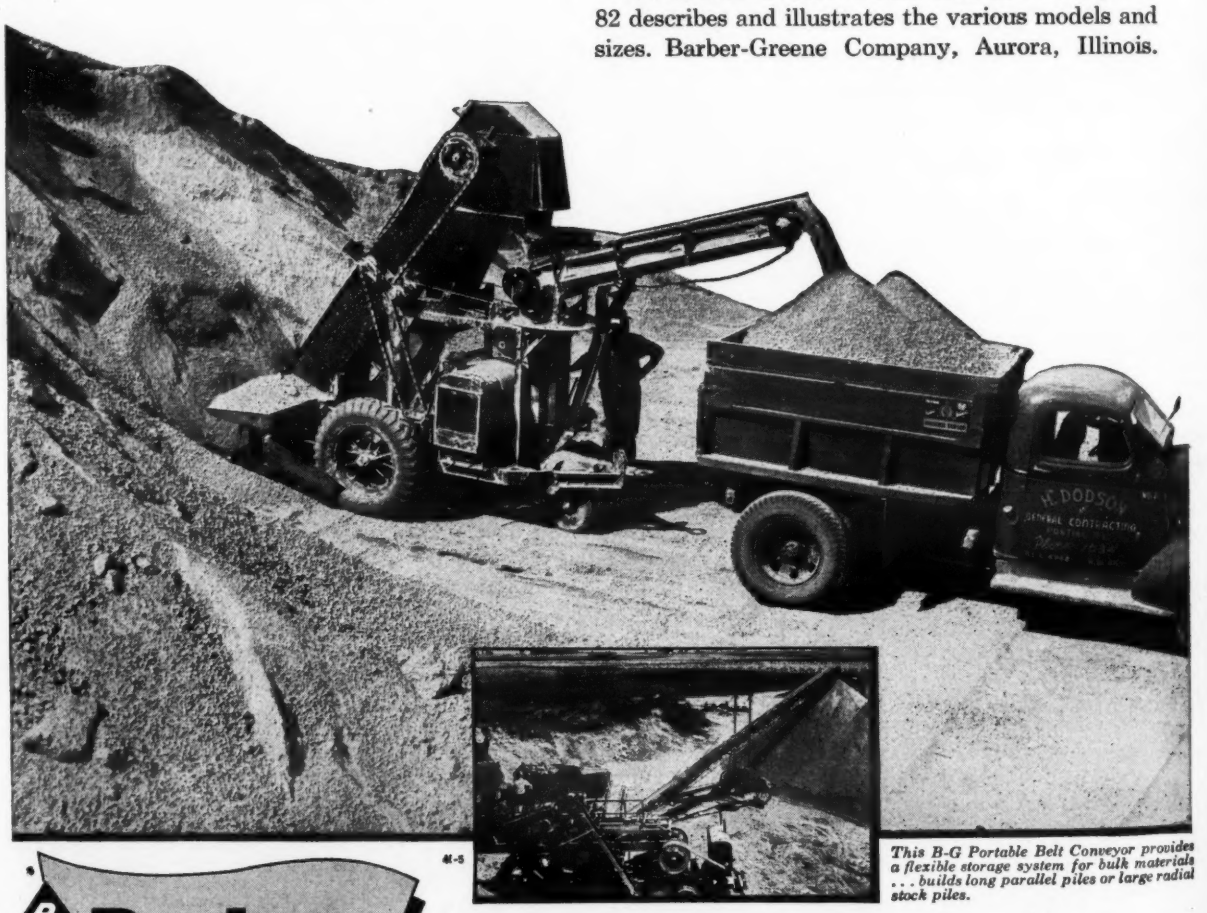
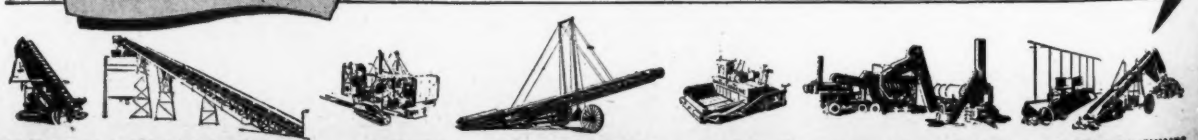
In addition, Barber-Greene Bucket Loaders are easily maneuvered around the yard or pit, and, where conditions warrant, can be equipped with a special high travel speed for moving from stock pile to stock pile.

The Barber-Greene Bucket Loader Catalog No. 82 describes and illustrates the various models and sizes. Barber-Greene Company, Aurora, Illinois.



This B-G Portable Belt Conveyor provides a flexible storage system for bulk materials . . . builds long parallel piles or large radial stock piles.

Barber-Greene CONSTANT FLOW EQUIPMENT



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County Maintenance Being Decentralized

(Continued from preceding page)

99 motor graders.

In addition, the County owns and uses for both winter and summer maintenance a Walter 3-ton truck; two 1½-ton Chevrolet trucks; two 1½-ton Ford trucks; two Diamond T 2-ton trucks; a 2-ton Dodge truck; a 2-ton International truck; a Ford pick-up; two International pick-ups; and two International panel trucks. The total estimated value of all county-owned heavy equipment and machinery is $61,476.

New Construction

The Olmsted County Board of Commissioners and Mr. Leonard, the County Highway Engineer, firmly believe in the contract system.

"Any work where there is a unit of measurement other than 'per hour' is handled on a contract basis in Olmsted County," declares Mr. Leonard. "If the work is of such a nature that we can draw plans and specifications, we advertise for public competitive bids."

During last year, however, because of war conditions, construction of 9.2 miles of roads was undertaken by county forces with leased equipment.

The first project was a 5.9-mile grading project on State-Aid Road No. 7. Engineering consisted in field staking after establishing a profile grade. The work was not balanced before staking except in the western ¾ mile where the topography was quite rugged. The topography of the remainder of the work was flat, with good natural grades and drainage. The new grade was constructed almost entirely from side borrow. The presence of thin bedded limestone throughout, at a depth of from 2 to 3 feet below the surface, required in many instances the use of rippers to loosen the material before scraper operations. Excavating quantities were established at between 25,000 and 30,000 cubic yards per mile. A breakdown of the approximate costs per mile of this 5.9-mile grading project follows:

	Cost	Per Cent of Total
Clearing and grubbing	$ 195.00	2.9
Fencing	162.00	2.4
Excavating	3,140.00	46.6
Culvert pipe	1,008.00	14.9
Seeding	209.00	3.1
Crushed-rock surfacing	1,760.00	26.2
Engineering	235.00	3.4
Right-of-way	33.00	.5
Total	$6,742.00	100.0

The second construction project undertaken during 1945 by county forces with leased equipment was 3.9 miles of grading on State-Aid Road X. Here the topography was more rugged than on the other project and the profile grade was established by balancing. The soil was a silty clay loam with pockets of loess. Below a depth of 3 to 4 feet, most cuts contained wet pockets due to seepage and poor subdrainage. A good deal of subgrade excavation was required and soil selection necessitated considerable cross hauling. Rock encountered was heavy ledge formation, totaling some 6,000 cubic yards. About half of the rock excavation was handled by dozers and rippers; the remainder was drilled and blasted.

Construction costs per mile were:

	Cost	Per Cent of Total
Clearing and grubbing	$ 223.00	2.1
Fencing	10.00	0.1
Excavating	5,880.00	55.0
Culvert pipe	1,830.00	17.1
Seeding (not completed)	50.00	0.5
Crushed-rock surfacing	2,300.00	21.5
Engineering	378.00	3.5
Right-of-way	27.00	0.2
Total	$10,698.00	100.0

Although Olmsted County has nearly $500,000 available for road construction and maintenance during 1946, Mr. Leonard believes that men, equipment, and construction materials will be scarce with resultant high costs. The 1946 construction and maintenance program will probably total no more than during the war year of 1945, when $118,730 was spent on maintenance and $79,221 on construction.

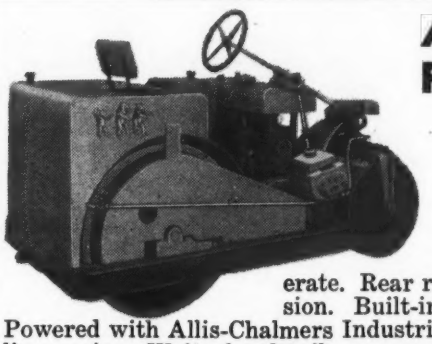
County Shop

County equipment is maintained and repaired at the county shop located at the southeast edge of Rochester. The shop and office are housed in a modern brick-and-stone structure erected in 1937. The building has overall dimensions of 83 x 97 feet and contains the repair shop, offices, drafting room, and stock room.

The shop is well equipped with a 100-ton hydraulic press; an automatic-feed drill press taking up to 1-inch drills; a Lincoln 300-amp dc welder; bench grinders; a 4-ton overhead traveling crane; and acetylene welding equipment. Routine maintenance, minor repairs, and overhauling are done at the shop by a mechanic and his helper. Reconditioning and machine work are done by commercial shops in Rochester.

Personnel

The Olmsted County Highway Department employs 23 full-time workers with 10 to 20 seasonal workers added to the payroll as needed. The County Highway Engineer, A. C. Leonard, represents counties in Minnesota, Wisconsin, North Dakota, and South Dakota as a member of the Board of Highway Consultants, Public Roads Administration, for the Federal-Aid Secondary Program.



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Stops wheel spinning!

In conventional two and four wheel drive trucks, the wheel that *slips* gets the power—then wastes it spinning and churning its way deeper into the mud.

In contrast, the Walter Four-Point Positive Drive automatically *stops* sending power where it *cannot* be used and puts it where it *can* be used—in the wheels that *have* traction. This is done by three automatic locking differentials. They arrest wheel spinning by proportioning the power to the FOUR driving wheels according to their traction at any instant.

That is why Walter Tractor Trucks haul in bad weather when other trucks are stopped or stalled —why they haul enormous loads through soft dirt, deep mud, up steep grades and over slippery surfaces. That's why they do not grind tires or gouge roads. That's why they carry bigger payloads in open pit mining, strip mining and off-the-road hauling, faster than any other truck. Get the complete story about these unique trucks, today. They can save money on *your* jobs, too.

Frost, Load Effects On Airport Pavement

The Army Corps of Engineers has been investigating the effects of frost and huge loads on airport pavements. Tests made at Selfridge Field, Mich., by the Detroit District Engineer Office towards the end of the past winter are expected to bring revisions in the Airfield Pavement and Airfield Drainage Design sections of the Army Engineering Manuals.

The frost investigations carried out by the Detroit District involved detailed research into the many factors affecting pavement strength. Traffic loads were tested in concurrent studies. Ground-water elevations, foundation materials, and the amount of heave in pavement that results from the formation of ice lenses in the underlying soil, were among the subjects studied.

Eight thermometer wells were sunk at depths of 1 to 8 feet below the airfield pavement to record subsurface temperatures. Test pits were cut through the 10-inch pavement to the depth of the water table, to obtain moisture and density samples of the soil and to follow the frost level down into the subgrade and back to the surface again. The engineers utilized twenty-two ¾-inch galvanized-iron pipe wells to gather data on subsurface drainage conditions.

Traffic-load tests were made with special equipment which duplicated the loading of heavy bombers. Wheel loads up to 60,000 pounds on a dual-wheel assembly were used. During tests from March 2 to 25, this equipment was pulled over one area 15 times daily to simulate the capacity operation of a B-29 on a runway, and over another area 45 times daily to simulate the B-29 on a taxiway.

Two large tanks of water were supported by 10-inch I-beams at each end of a 30-foot I-beam. These were used as the resisting force to apply a 100,000-pound pressure on the corner of a 10-inch concrete apron slab by means of a 50-ton hydraulic jack set on a 24-inch-diameter steel plate. In this way the engineers measured deflection in the concrete under various soil conditions as a result of applying certain pressures.

Carl O. Wold Retires

A pioneer in the development of modern earth-moving equipment, Carl O. Wold has retired from the Vice Presidency of the Caterpillar Tractor Co. He has seen 40 years of service with the Russell Grader Mfg. Co. and with Caterpillar; he was executive head of Russell when Caterpillar acquired that firm in 1928.

Under Mr. Wold, Russell was the first firm to use a separate power unit on elevating graders. It also introduced the forerunner of the modern bulldozer. While with Caterpillar, Mr. Wold helped to guide the development of the motor grader and the bulldozer of today.

During World War I, Mr. Wold served on the War Service Committee for the Road Machinery Industry. In World War II he supervised part of Caterpillar's war production. He has been active in the American Road Builders' Association and the National Highway Advisory Council.

AH&D Staff Changes

Raymond J. Dervey of St. Paul has been placed in charge of the Pittsburgh office of the American Hoist & Derrick Co. He succeeds Ralph Thomson, who has become Manager of the New York City district. Mr. Thomson has served at Pittsburgh for many years. Mr. Dervey was a Major with the Army for the past five years.

ESCO 4-½ yard dragline bucket on SW Monighan working on Friant Canal, in California

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When construction men, year after year, make repeat purchases of *ESCO* dragline buckets, it means just one thing—

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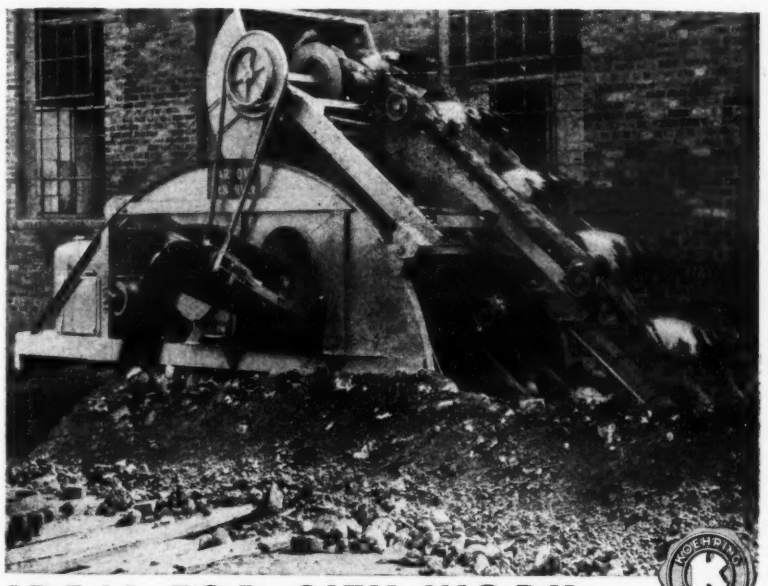

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BUY *all the Bonds you can . . .* KEEP *all the Bonds you buy*

Accident Reduction Ups Job Production

New Safety Policy by Engineer District Puts Emphasis on Increasing Contractor Efficiency

(*Photos on pages* 40 *and* 41)

✦ ONE of the most eloquent safety posters ever to appear on a construction job read, "When the roll is called up yonder, don't be there on account of an accident". All too often, however, the roll *is* called up yonder, and much too frequently people *are* there because of a preventable mishap.

The Los Angeles District Office of the U. S. Army Engineers is trying to change all this. And successfully, too, for it ranks high in the Pacific Coast safety standing. It is trying to make working conditions on its dams, flood-control channels, and other dangerous heavy jobs, actually safer for its workmen than their automobile ride home at the end of the day.

The Los Angeles District now has in force a policy which has long been advocated by the workers themselves: put safety and its control out on the job where it belongs. That's where the accidents happen. Let the foremen, who normally give the orders to start a concrete pour, give the safety-first orders, too. Make the quarry boss responsible for dangerous overhangs at his quarry, and so on.

About seven years ago, the people in charge of safety in the Los Angeles District decided on this somewhat radical change of policy. Up to that time, safety had been administered by District-Office personnel and just as quickly forgotten after the traveling inspectors departed. Now the District-Office Safety Branch outlines its broad policy, standardizes action among the many different jobs, and acts purely in an advisory capacity. The safety the men in hard hats see is all administered by supervisors they know; by men who "belong" on the job. Many of the rules—indeed, many of the safeguards now in use—are suggested by the workers themselves in regular meetings.

Broadly speaking, the Los Angeles District meets with a preponderance of serious accident menace around heavy equipment, for its jobs consist of the construction of dams, wide flood-control channels, or airports. During the war the District worked a peak of 53,500,000 man-hours—that was in the boom year of 1942—and saw safety pay off in greater productivity of its workmen and in reduced cost of accident insurance.

The Safety Organization

The safety organization is called the Safety Branch. It operates independently of other branches under the jurisdiction of the District Engineer and his Executive Officer. The Chief of the Branch, George F. Arndt, went to work for the Engineers back in 1935, so he has watched the phenomenal rise and fall of man-hours and accidents. Arndt has five full-time resident safety engineers who work out on the projects. One safety worker from his section calls frequently on resident engineers, inspectors, and contractor's foremen to hold safety meetings.

These safety meetings are far from the usual dry gatherings on construction. They have real value. They consist more nearly in controlled conferences than in vague get-togethers, with the District safety worker acting as a sort of honorary chairman. He gets no less than six nor more than ten of the key men together at the start of a job, and makes a brief talk on the District policy. After that he leads the meeting and trains discussion on worthwhile and constructive issues. Arguments are encouraged if they will lead to a lower accident record.

Surprisingly enough, District policy is almost cold-blooded. It regards an accident on a piece of heavy equipment just as serious from the standpoint of time the machine will lose while its operator is being replaced as from the standpoint of the man who was hurt. It believes that safety practices which lower accident frequency result in more work time, with higher output, for contractors as well as for its own forces. Actually, then, this policy is neither cold-blooded nor at variance with common humanitarianism. Rather, it is simply farsighted. It also gives rise to the unusual situation of safety inspectors being concerned with the efficient operation of tractors, sheepsfoot rollers, drills, and power shovels.

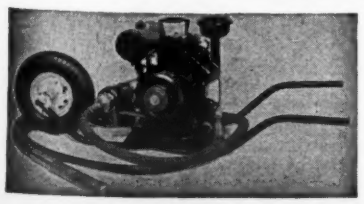
An Example of Accident Prevention

This policy of helping rather than dictating frequently takes odd turns. It did so several years back, when wartime construction was at its peak and unskilled laborers were hiring out at high wages for whatever they represented themselves to be. The District let a contract for the installation of additional insulators on a high-tension power line, prior to a switchover of power from 4,800 to 33,000 volts. It was necessary to work the line "hot", because it led down to a hospital which could tolerate no interference with its source of electricity.

As it must always do before a job begins, the Safety Branch worked out a list of required accident-prevention measures for its field representatives. It was a foolproof list, with one exception. There was no way to determine whether the men who hired out as linemen were really linemen or inexperienced laborers out after the higher wages.

The District had previously experienced this difficulty on a remotely located project, when a "lineman" was killed. The investigation in this case disclosed that the man had misrepresented his background. The nearest

(*Continued on next page*)



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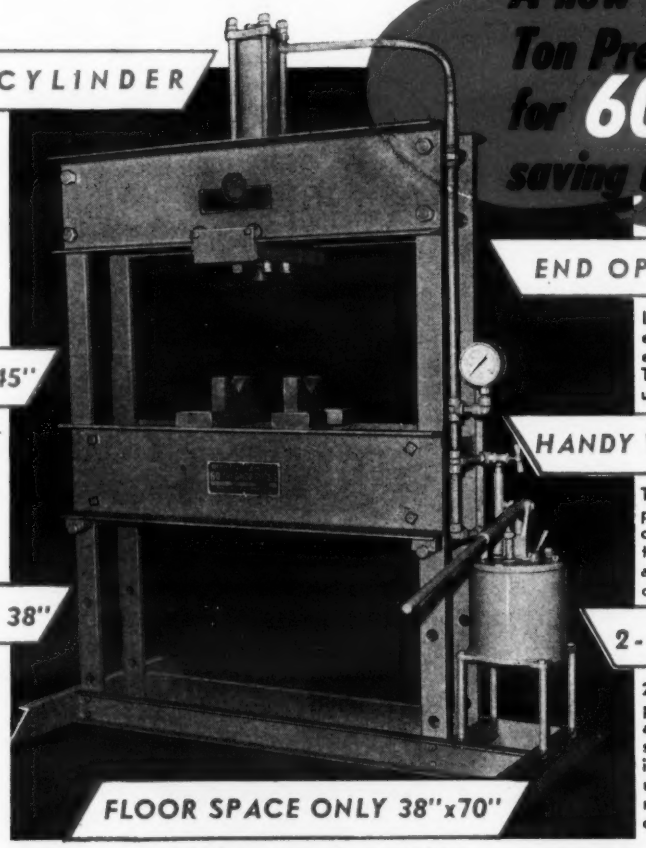

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Cylinder is adjustable completely across top bolster—mounted on four rollers that ride on the bolster channel. Ram travel 2½" per stroke of pump. Cylinder detaches from press and with added hose may be used as a jack, clamp or press in any position.

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Working daylight between top and lower bolster adjustable from 8" minimum to 38" maximum. Bolster is raised and lowered by a hand crank.

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Long work may be slid through either end of the press without encountering any obstructions. The opening between the columns is a full 8".

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2-Speed pump, sturdy and simple, self lubricating, needs no attention. Ram moves 2½" each stroke of pump when pump is set for high speed — giving up to 2,000 lbs. pressure in rapid travel. Flip of lever changes pump to high pressure.

FLOOR SPACE ONLY 38"x70"

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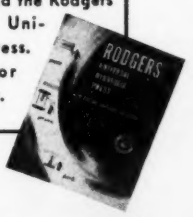

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Accident Reduction Ups Job Production

(*Continued from preceding page*)

thing to skilled work which he had ever done was to drive a truck. When made acquainted with this past fatal experience, the local union near the new "hot-line" job was just as anxious as anyone to see that the men it furnished were classified properly. But it was handicapped by numerous requests for labor, as well as by an inadequate staff of its own. It was in no position to check fully the past experience of linemen who wished to clear the local union for the job.

The Safety Branch therefore volunteered to take on the responsibility of checking the background of every man who claimed to be a lineman, if the union would furnish his name. It was agreed that a man was to be so cleared before he would be permitted to go to work. Names were telephoned in from the project to Los Angeles, and the Safety Branch telephoned many electric-power companies all over the country, which these men had given as references. Frequently a company's answer to the sleuthing went something like this: "Hell, that guy's no lineman. He never had his feet off the ground when he worked for us."

These men were carefully weeded out, and the experienced linemen were then allowed to proceed with their work. The job was completed accident-free. Several months after it was finished, the contractor's superintendent called on the District Safety Branch and expressed his appreciation for this help, which he was frank to say he had been skeptical of at first.

One of the most difficult things for the Safety Branch to whip was not mechanical ways and means, but an idea. It has generally been accepted for years that $1,000,000 worth of construction is going to cost a human life. In the past—and not the very dim past—when a life was lost, an investigation was made more or less perfunctorily. All too often the attitude seemed to be "So what? You've got to expect it". This line of thinking became so deeply ingrained that pile-driving contractors were paying $20 insurance on each $100 of their payroll, without a whimper. They accepted it as part of the hazards of that type of work.

But the Safety Branch has now succeeded in changing that idea by a demonstration of how the number of accidents can be lowered. The main point is this: it has succeeded by *demonstrating* instead of by commanding. Of course, it can resort to force if need be, because it now has put teeth in the safety phrasing of its contracts and a job can be closed up tight if necessary. But this procedure seldom is resorted to, and matters are handled by arbitration. Safety has become automatic.

Safety in Action

One of the recent jobs to be undertaken by the Los Angeles Engineer District is the construction of a channel for the Los Angeles River. This flood-control job affords an opportunity to study exactly how the Safety Branch works.

When the contractor moved in, he received this individualized memorandum:

"In the interest of safety and accident prevention, *and the expediting of operations,* there are attached suggestions and requirements that not only supplement War Department Handbook 'Safety Requirements for Excavation-Building-Construction', but highlight predominant precautions and methods on channel projects which, when adopted, will speed up operations and minimize the expected normal accident frequency of the work that is to be accomplished."

It goes on to list all the safety equipment needed: hard hats for shovel and dragline spotters, dump men, grizzly and gravel-plant men, pile-driving crews, carpenters, and all concrete workers on structures. It suggests safety shoes for all rock workers, and power-tamper or jackhammer men. Goggles are a "must" for shop men, mechanics, drillers, chippers, grinders, and rock workers.

Safety belts are prescribed for form builders, strippers, and reinforcing-steel workers. Concrete crews should have petrolatum to ward off cement burns. All company-furnished rubber boots should be equipped with safety toes and puncture-proof insoles. Flagmen should wear red jackets, and there should be some red bunting handy for the making of flags. Permissible flashlights should be used by powder men or oil-house men instead of matches.

Respirators should be used by employees at mixer plants or men handling

(*Continued on next page*)

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Study the fencer's movements. Watch him in action. He's graceful, agile, light on his feet. Muscles flow freely. There's nothing about him suggestive of tension. He's learned to *relax* while engaged in a contest of skill and endurance.

In Bethlehem's Form-Set rope, you'll find much of that same relaxed effect—a quality that pays heavy dividends.

Every wire and strand of Form-Set rope is preformed into a permanent helical shape before being laid in the rope. This means that the inner tension has been eliminated. The wires and strands have no tendency to "fight themselves" or each other.

You can prove this simply by cutting a section of Form-Set, leaving it unseized. Each and every wire lies just as it was. No bushing—no flying apart—for the wires and strands are *relaxed.*

What does this mean? For one thing, easier handling. More important, though, is the longer life that often results when the rope is subjected to sharp turns and bends—reverse bends, for instance.

All grades, sizes, and types of Bethlehem wire rope can be obtained with the Form-Set construction. Ask the nearest Bethlehem office or distributor to tell you more about it.

Here is a piece of "relaxed" wire rope. Even when cut or broken, the Form-Set wires and strands lie calmly in place. No tension at all—yet the toughness remains.

When you think WIRE ROPE . . . think BETHLEHEM

Accident Reduction Ups Job Production

(*Continued from preceding page*)

bulk cement. Field drinking fountains, either bubbler fountains or those with individual paper cups, and salt-tablet dispensers, should be installed. Chemical-type toilets are required on construction work in the city limits of Los Angeles, so their use was strongly urged. On the list were such things as linemen's rubber gloves, belts, safety straps, climbers, hot sticks, and fuse pullers.

By correlating this list with his own estimated man-hours of each type of labor on the job, the contractor could, if necessary, pick up a catalog and order exactly what he needed.

The memorandum then suggested safety procedure for each class of work to be done before the project was complete. It covered haul roads, electrical hazards, flat-rack and pick-up trucks, motor graders, tractors, concrete mixers, dump trucks, boom equipment, sanitation, pouring concrete, clean-up, placing of utilities, and reinforcing-steel assembly.

Some Safety Rules for Haul Roads

As an illustration, take the classification "haul roads". The suggestions listed may be general in some instances, but for the most part the study had been an individual one, applicable particularly to the river job. Read a few of these rules:

1. Roads that skirt deep pits along the river-bank should be fenced, not with the idea of stopping the equipment so much as to outline the road.

2. At bad intersections, a flagman should be used.

3. Earth ramps to embankments should be outlined along the edges with striped posts or markers in the daytime, and with lanterns or bomb torches at night. Regardless of the quality and quantity of overhead lighting, the edges of the ramps and pits should be marked. If possible, one-way ramps are recommended.

4. Weeds and brush should be stripped well back from the haul roads so that no holes or ditches will be concealed. (County road-maintenance engineers please note!)

5. Any guy wires near roads should be outlined with painted wood strips fastened to the wire.

6. If possible, keep from having a haul road on a city street, especially if it is narrow. Many claims for damage to property are made when densely populated streets are used for haul roads. These claims consist mainly of loosened plaster, etc.

7. It is common practice in some localities to permit passing to the left in order to favor loaded equipment. The hazards outweigh the advantages and the practice should not be allowed. If it is done, signs and flagmen should be used.

8. Fog is a constant hazard. All southern-California river valleys are subject to dense, low fogs, which come in quickly at night. Orders should be issued to slow down during fogs. Outline of the road by markers may be necessary.

9. Roads and ramps should be maintained by grader and sprinkler trucks. Sprinkler trucks can make roads considerably safer by keeping down dust. Sprinkling clay haul roads should be done lightly to minimize the danger of skidding.

10. Study is required in the matter of whether to permit drivers to turn off headlights on turns and ramps to keep from blinding drivers of approaching equipment. General lighting conditions and the width of the road determine the safest method.

11. Haul roads that cross main highways should be protected by the use of truck-crossing signs, placed on the main highway 300 feet from the haul-road crossing. These signs should be lighted at night by flares. If main highway traffic is heavy, a flagman and stop signs are necessary.

12. City streets which dead-end into a haul road and are not used as a part of the system of haul road should be barricaded to prevent private vehicles from using the haul road as a highway.

Do any of these twelve rules violate the laws of common sense? If they do not, they might be adopted to advantage in other sections of the country on haul roads, where conditions are similar. We should like to emphasize even more strongly rule No. 9. The maintenance of haul roads by blade graders and sprinkler trucks has been proved to be a paying investment just from the standpoint of wear on equipment. Tires wear longer on smooth haul roads, loads of dirt reach the fill in less time, and operator fatigue is considerably decreased. Did you ever watch the driver of a loaded truck on a rough road? Well...

Safety in the Field

The resident safety representatives are the real cogs in the District safety machine, for they are the men who must give orders and suggestions locally, and then see that their suggestions are followed up. In the case of the river job, the field-safety representative had these duties to perform:

He had to hold a safety conference with responsible contractor personnel the first day they arrived on the job. He then continued this conference from day to day until all phases of safety and

(*Concluded on next page*)

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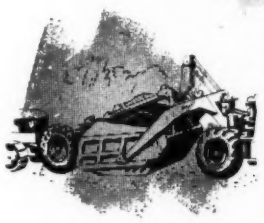

G. S. STORATZ

Master's degree in metallurgy • B.S. degree in engineering • Entry on high-speed dirt movers won first prize in the James F. Lincoln welding competition for 1940-1942 • Author of many articles on welding • Engineer in charge of Road Machinery at The Heil Co.

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R-70

Accident Reduction Ups Job Production

(*Continued from preceding page*)

accident prevention were properly provided for. He also met with the contractor's auditor and his insurance company if the contractor wished.

He inspected the work site before the job started, and reviewed the plans to make advance safety provisions. Bearing in mind that he cannot justify his salary unless he does increase production through accident prevention, the job safety man must be a diplomat and a hard-headed realist simultaneously. If necessary—and he is the sole judge of that—the field safety man must make inspections once a day. Occasionally he runs into a contractor like Guy F. Atkinson, holder of this contract, who has long since learned that accident prevention lowers insurance costs and speeds output. Then his inspections become less frequent, for the foremen and workers assume their share of safety on an Atkinson job.

Later during the present construction season, when this particular job gets fully under way, it will be described in the pages of CONTRACTORS AND ENGINEERS MONTHLY. The safety features will then have had time to produce results. They will be reported.

Driver Regulations

In the Los Angeles District Office are all the machines, charts, and other paraphernalia for the examination of automobile drivers preparatory to the issuance of a driver's license. Drivers are checked for coordination, peripheral vision, speed perception, and their knowledge of traffic regulations. It is a notoriously stiff examination. Plenty of drivers who now hold licenses have had to make more than one trip to get them.

Personnel

The Los Angeles District reached a low of 8,586,000 man-hours for 1945, after having seen nearly 53,500,000 man-hours in 1942. It is now again on the upgrade. The resumption of a huge civil-works program of flood control will skyrocket the man-hour figure for 1946 and 1947. The Safety Branch is determined that it shall soar only with a minimum of suffering and lost lives. If it can get this result while boosting contractor efficiency at the same time, so much the better for everyone. Nobody profits from an accident.

Colonel Robert C. Hunter is the Los Angeles District Engineer, Colonel John M. Johnson is his Executive Officer, and George F. Arndt is Chief of the Safety Branch. Since the new policy was started, the employees of the Safety Branch have been sharply reduced in number, already a first-hand proof that safety pays.

Bolivia to Re-Route Pan American Highway

Highway progress in Bolivia has been reported by that nation's Chief Highway Engineer, Juan B. Aramayo, who is visiting in this country. Señor Aramayo is a guest of the American Road Builders' Association, the Public Roads Administration, and the Office of Inter-American Affairs. He is studying U. S. highways, building methods, and materials, and he will visit road-building-equipment plants.

A very good job is being done in the face of many difficulties in building a new 305-mile highway to connect the highland city of Cochabamba with Santa Cruz in the eastern lowlands, the Bolivian engineer reports. The McGraw-Warren Co. is the contractor for the job. Lack of equipment is the major problem faced in the project.

About 400 men are at present working on the new highway, and if all goes well, it will be finished within three years. An existing dirt road is being replaced by the highway, so that year-round passage will be possible. A maximum grade of 6 per cent on the route will permit speeds up to 40 mph. Elevations of nearly 12,000 feet will be reached.

Bolivia is also surveying a new route for the Pan American Highway. This is to follow valleys that have a much lower elevation than the present highway. Such a route will be an aid to tourists and will serve to open up a productive agricultural region.

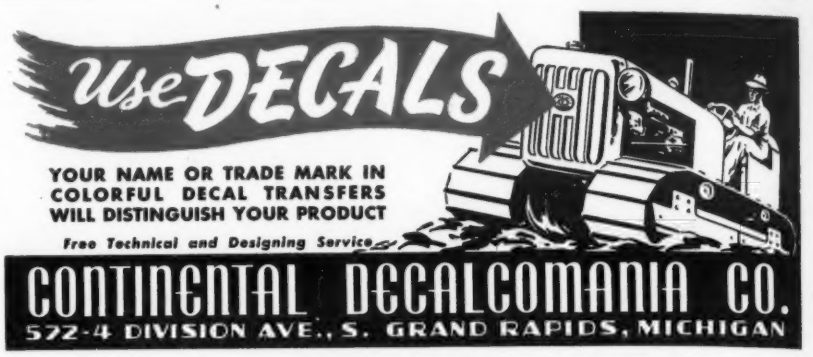
Lists Friction Materials For Automotive Vehicles

The 1946 catalog of the Raybestos Division of Raybestos-Manhattan, Inc., lists data and gives illustrations of all the firm's products, including brake linings, clutch facings, and fan belts. It covers the friction-material requirements of all vehicles in the truck, bus, passenger-car, and industrial-equipment fields, in some cases going as far back as 1926. Extending index tabs mark quick-reference sections of the catalog. It presents the latest information concerning the new Key-Lok brake block and the Ray-Metl clutch facing.

Copies are available on request. Write the Raybestos Division at Bridgeport, Conn.

Truck Firm Looks Ahead

Trucks for America's peacetime needs are featured in a brochure just issued by the White Motor Co., 842 E. 79th St., Cleveland 1, Ohio. The booklet pictorializes some of the firm's contributions to the war effort, scans the future, and outlines White's maintenance service and dealer organization. Copies can be obtained on mention of this notice.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BENTON HARBOR MICHIGAN

N. Y. Dept. of Public Works Photo
This unstable condition of shoulder on the Sunrise Highway, due to lack of binder in the soil, was corrected by a recent stabilization project.

Shoulder Stabilized, Mulched and Seeded

Combined Operations With Equipment Save Time and Money; "Floss Rig" Pumps Fertilizer and Lime

✦ SOME 5,220 feet of 10-foot shoulder was stabilized, mulched, and seeded this spring in Suffolk County, Long Island, N. Y. Of this, 3,000 feet was along the west side of Farmingdale Road, State Route 109; and 2,200 feet was along the Sunrise Highway Extension, State Route 27. The work was done by a maintenance crew of District 10, New York State Department of Public Works. In this operation excellent advantage was taken of equipment which is generally recognized as standard for such work. But an innovation was also employed in a "floss rig" to spray fertilizer, lime, and water over the section under improvement. The use of adequate machinery enabled a small crew to complete this job within two weeks, in spite of some rainy weather during April.

Route 109 is a dual concrete highway with a grassed median strip. It links such important east-west Long Island arteries as the Montauk and Sunrise Highways and Southern State Parkway with the great aircraft factories to the north near Farmingdale. When the highway was built, the original concrete road and macadam shoulder along this particular section were retained on the east side. The shoulder on the west side of the road was topsoiled and seeded. The topsoil that was brought in to make up the top 6 inches of shoulder soil contained about 60 per cent of fines. Beneath this was a layer of sand 6 inches or more deep. The result was that, in spite of a good turf cover, during periods of rain or in the spring when the frost was coming out of the ground, the shoulder rutted badly from occasional use by traffic. It was to overcome this condition that the recent combined operation of stabilizing the soil and seeding on the shoulder was undertaken by a highway crew. The result was the pleasing development of a firm strip of turf bordering the concrete, which was accomplished in a short time with a minimum of expense and labor.

On the Sunrise Highway Extension, State Route 27, adjoining Route 109, the shoulder material in the section treated was an unstable sand; here binder soil was added to provide stability.

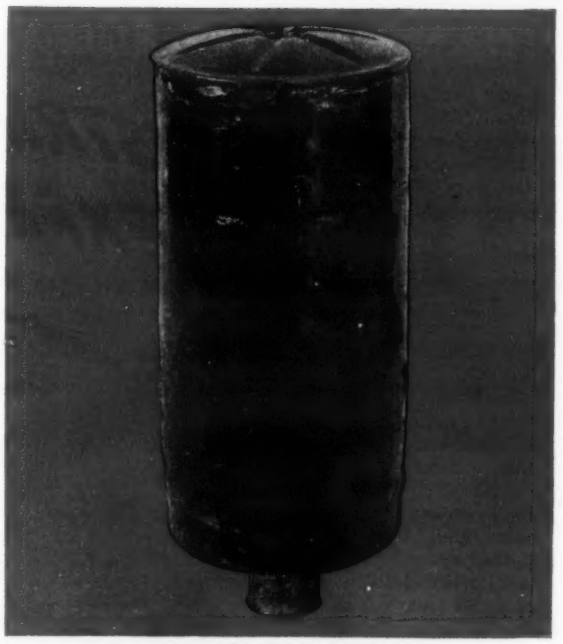
N. Y. Dept. of Public Works Photo
Topsoil from the shoulder on Route 109 on Long Island was picked up by an Athey Force-Feed Loader and taken to the Sunrise Highway for binder on the shoulder there.

Grading

On Route 109, a Galion 101 power grader first stripped a 2-inch layer of

(Continued on next page)

Diesel Engine DANGER points



Filter deposits formed in 204 hours with best uncompounded mineral oil.

Clogged Oil Filters Cause Frequent Shutdowns

One cause of frequent costly and time-wasting Diesel shutdowns is filter clogging. The condition can become dangerous since a clogged filter may stop circulation of oil to the engine if the warning of a drop in oil pressure is not heeded. Analysis of filter deposits prove them to be composed of products resulting from incomplete burning of the fuel and oxidation of oil plus iron, silica and water.

RPM DELO Oil Reduces Filter Clogging Two Ways

As the two filters illustrated show, RPM DELO Diesel Engine Lubricating Oil greatly lengthens the time between shutdowns for filter servicing. This is accomplished in two ways:

1. A detergent in RPM DELO Oil prevents the stuck piston rings which, through blow-by, permit dust, unburned fuel and carbon to mix with oil.

2. Another compound in RPM DELO Oil fortifies it against oxidation.

Other additives in RPM DELO Oil protect Diesel Engines against corrosion, excessive wear on upper cylinder walls, and foaming.

Filter Deposit formed in 1230 hours with RPM DELO Oil.

To match the fine performance of RPM DELO OIL, use these equally efficient companion products from the same famous "RPM" line—RPM HEAVY DUTY MOTOR OIL—RPM COMPOUNDED MOTOR OIL—RPM GEAR OILS AND LUBRICANTS—RPM GREASES. For additional information or name of your distributor, write any of the companies below:

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THE CALIFORNIA COMPANY · 17th and Stout Streets, Denver 1, Colorado
STANDARD OIL COMPANY OF TEXAS · El Paso, Texas
THE CALIFORNIA OIL COMPANY · 30 Rockefeller Plaza, New York 20

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EIGHT SIZES
Up to 1000 Tons per day
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Two-Fire and Internal Fire
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Electric Batch Timers
50 Years' Experience
THE F. D. CUMMER & SON CO.
EAST 17th & EUCLID
CLEVELAND 15, OHIO

N. Y. Dept. of Public Works Photo
On Route 109, a Galion 101 grader made several passes over the shoulder to mix the underlying coarse material with the top 6 inches of fine topsoil.

Shoulder Stabilized, Mulched and Seeded

(Continued from preceding page)

topsoil from the 10-foot shoulder, pushing it off the shoulder into a windrow. This valuable material was then loaded into a truck by an Athey Force-Feed Loader and carried to the Sunrise Highway (Route 27) where it was used as the binder soil required there. Then the grader, with its 10-foot blade set at the sharpest possible angle and also tilted to keep the digging end low, plowed the soft shoulder to a depth of plus or minus 12 inches. In this way the coarser and more stable sand in the bottom 6 inches was turned up so that it mixed with the upper 4 to 6 inches of the finer topsoil. The grader made several passes over the shoulder in this plowing operation, first working along the edge of the concrete, and then returning along the outside edge of the shoulder.

Further mixing of the two different types of soil was continued with the use of a harrow having eight 24-inch scalloped disks. Four of these threw the soil to one side while the remaining four threw it in the opposite direction. Weights were placed in frames on top of the disks, in order to keep the blades down in the soil as much as possible and insure the best mixing. This rig was pulled by a Worthington rubber-tired tractor generally used for a mower.

After the soil materials were mixed, the shoulder was roughly shaped by the grader, and the top 6 inches bladed off to the outside. The lower 6 inches was compacted by a Galion 6-ton single 42-inch smooth-wheel roller. The material for the top course was then bladed back on the shoulder.

Fertilizing the Ground

Fertilizer and lime were then applied to the shoulder material, during the application of water. The harrow made another trip to mix these ingredients into the soil. The fertilizer was a 5-10-5 mix and the lime was calcium hydroxide. Both were added at the same time and mixed together into the soil.

Proportioning was simple when working on the 10-foot shoulder. Wood stakes were set in the ground at 100-foot stations. Ten stations, or 1,000 linear feet of shoulder, contained an area of 10,000 square feet. For this area, 250 pounds of fertilizer and 166 pounds of lime were used.

Floss Rig

Water, fertilizer, and lime were applied to the shoulder by means of a "floss rig", a novel unit made up in the District 10 highway shop. It has been put to good use by the Department in other roadside-development operations. The rig consists of a 500-gallon tank, roughly semi-cylindrical in shape, made of wood and held together by metal bands, and mounted on skids. It is transported by an International 3½-ton flat-bed truck. Through the lower part of this tank passes a shaft, with eight agitating blades, which is driven by a small Iron Horse 2-cycle gas engine located at the rear of the tank. Alongside this unit is a Gorman-Rupp 2-inch pump with an inlet hose line feeding from the tank, and a short length of 1½ or 2-inch hose with a ½-inch nozzle for the outlet.

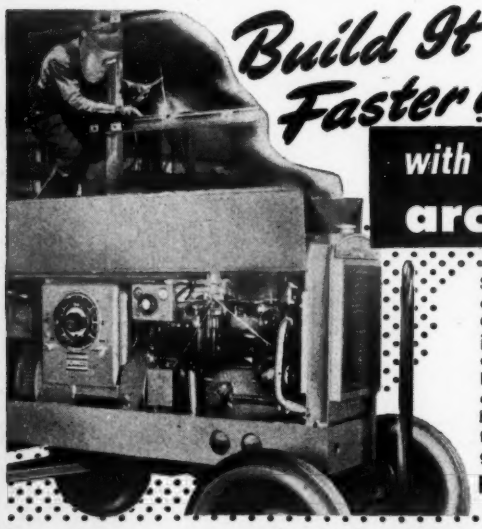
In this work, the fertilizer, lime, and water were agitated by the shaft blades, and then pumped from the tank and sprayed over the ground in a continuous operation. Proctor tests taken on similar soil indicated that the optimum moisture was from 8 to 10 per cent.

This rig was originally assembled for the purpose of seeding on a large scale without the use of hand labor; it enables such work to be done at a fraction of the usual cost. In such operations, seed, fertilizer, and lime are dumped in the tank, agitated through the water, and then thrown out by the centrifugal pump to as great a distance as 60 feet. This has saved time and labor in seeding large areas of slopes and roadside strips. With one tankful of material, from 5,000 to 10,000 square feet can be seeded, depending on the concentration required.

Because of the comparatively short distance involved in this particular stretch of shoulder work, and the use of different seed mixtures for experimental purposes, the floss rig was not used in seeding. Excellent results with it have been obtained along several Long Island roads, particularly on the

(Continued on next page)

C. & E. M. Photo
Further mixing of the two layers of soil was achieved by the use of a harrow pulled by a Worthington tractor.



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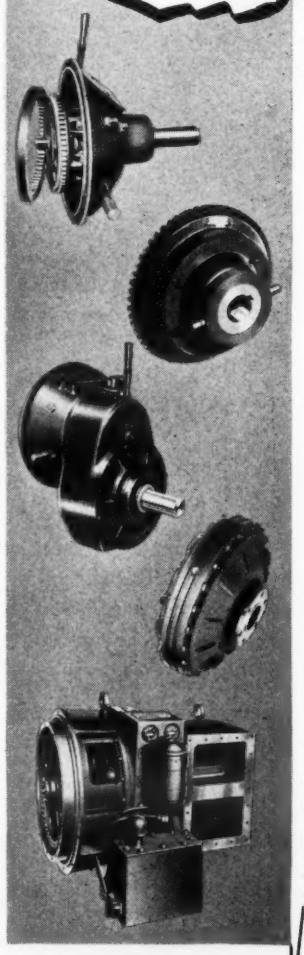

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Let Twin Disc Engineers study your individual problems in the transmission and control of power. They are prepared to advise you without bias as to which type of drive—friction or hydraulic—best fits *your* operational picture. Write for additional information today! TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).

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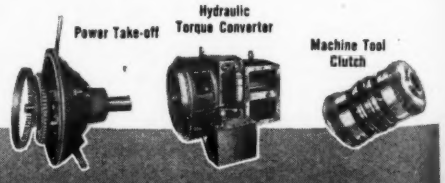


SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

N. Y. Dept. of Public Works Photo

Both bottom and top courses were compacted by this Galion 6-ton 42-inch-roll portable roller.

Shoulder Stabilized, Mulched and Seeded

(Continued from preceding page)

newer eastern portions of the Sunrise Highway.

Compaction

After the water, fertilizer, and lime were well mixed into the soil, the grader shaped the shoulder. It was then rolled. Compaction was secured by the Galion roller which had been used in grading operations. The roller wheel was filled with water to obtain the required weight. Water for the roller and floss rig was obtained from a fire hydrant located about ½ mile from the job.

After the shoulder was well compacted, it was given a final shaping by the grader. The original shoulder had a slope of ¼ inch to the foot, but this was increased to 1 inch to the foot. This middle expanse of Long Island is a flat plain, and surface run-off cannot be quickly obtained.

Mulch and Seed

After the shoulder was compacted and finally shaped, a thin layer of marsh hay, taken from the salt meadows of Wantagh along the shore of the Great South Bay, was spread over the soil to a loose depth of about ¼ to ½ inch. Seed was then distributed at the rate of 100 pounds to the acre by a mechanical seeder pushed over the shoulder by hand. This was covered with about ¼ to ½ inch of loose soil by a sand spreader on the rear of a truck. This top layer of soil prevented the mulch and seed from being blown away.

The seed formula used, except on one area described later, contained the following percentage proportions:

Kind of Grass	Per Cent Proportions
Creeping red fescue	57.0
Redtop	10.0
Smooth brome	20.0
Colonial bent grass	5.0
Canada bluegrass	5.0
Yellow trefoil	0.5
Wild white clover	2.5
	100.0

In one 350-foot section of shoulder on Route 109, a seeding test was made; it was also repeated on the Sunrise Highway shoulder. Various kinds of seeds were sown, each in a bed 10 feet long. Some of these were seeds not yet commercially available which were supplied by the Soil Conservation Service of the U. S. Department of Agriculture.

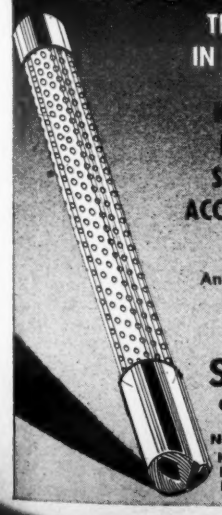
C. & E. M. Photo

This "floss rig," made in the N. Y. Department of Public Works District 10 shop, quickly distributed the fertilizer and lime mixed with water over the shoulder. It is also used for speedy seeding of shoulders and roadside slopes.

This agency is cooperating in a study of seed varieties best suited to certain conditions. Other factors being studied

(Concluded on next page, Col. 2)

STANG
WELLPOINT
SYSTEM



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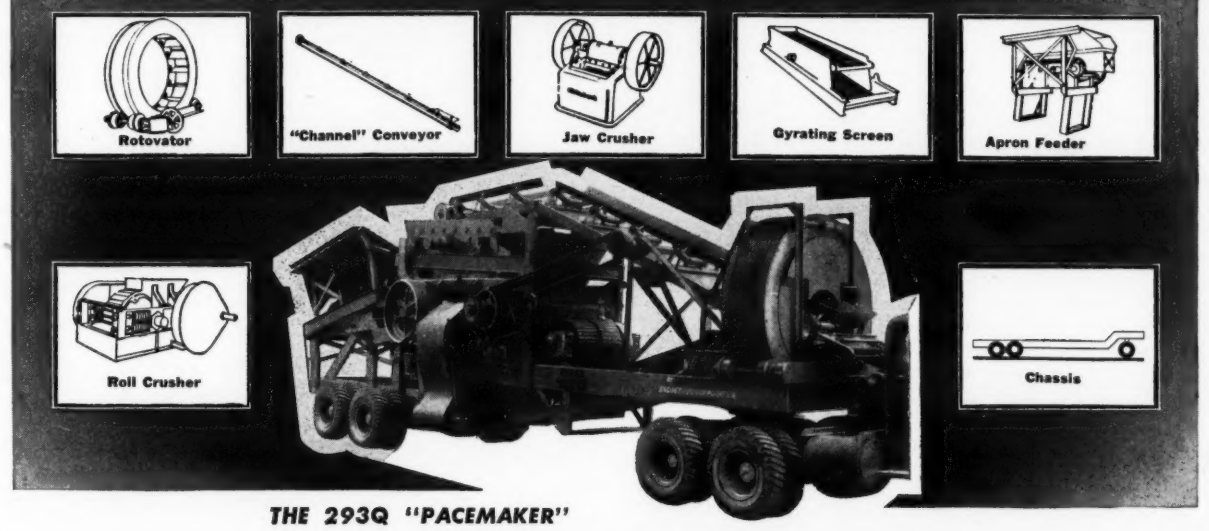

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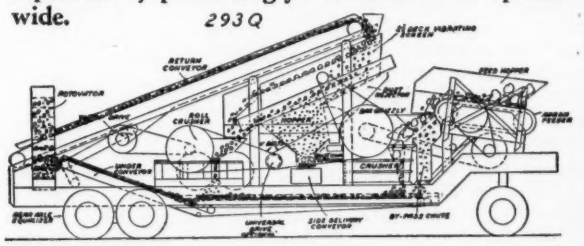
293Q



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ROCK AND GRAVEL CRUSHING
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ASPHALT PLANTS · SPREADEROLLERS

The new Goodyear Hi-Way Lug tire has alternate long and short lugs close together for smooth wear on hard roads and extra traction when needed for off-the-road operations.

New Truck Tire Has On-Off-Road Tread

The needs of vehicles that operate both on and off the road have been considered in a new truck tire put into production by the Goodyear Tire & Rubber Co., Akron, Ohio. The tire is made with a special tread design to provide traction and wearing qualities needed for the punishment taken in various construction operations. It will be available in three sizes, 9.00, 10.00, and 11.00-20.

Known as the Hi-Way Lug, this new tire has a deep, non-skid, and extra-heavy tread as well as added strength in the rayon-cord body to provide cut and bruise protection, Goodyear says. The lugs are placed close together for smooth rolling and even tread wear. The alternate long and short bars provide extra traction "in the rough".

The tires have specially compounded rubber to toughen them against road shocks and guard against separation and blowouts. Their construction, featuring rayon cord and extra-heavy rayon breakers, tends to minimize shearing action between tread and carcass and provide effective resistance to cutting, snagging, and bruising, it is claimed.

Threading-Tool Tips Made of Hard Carbide

A new line of standard carbide-tipped threading tools of the 60-degree V-nose type has been put on the market by the Carboloy Co. Known as Style T-15, the tools have tips of Carboloy 78-B, a tough and wear-resistant grade of carbide. Shank sizes include ⅜, ½, ⅝, and ¾-inch-square styles. The lengths run from 2½ to 4½ inches. A primary clearance of 3 degrees at the nose, and a secondary one of 6 degrees, provides free cutting while insuring ample support for the nose of the tool tip, Carboloy says.

Further details concerning the T-15 threading tools can be secured by writing the Carboloy Co., Inc., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Just mention CONTRACTORS AND ENGINEERS MONTHLY.

New Plastic Slide Rule

Greater dimensional stability is promised for a new 10-inch slide rule being produced by the Charles Bruning Co. Made of plastic, the rule's precision graduations are said to be unaffected by temperature variations. Nine scales—A, B, CI, C, D, K, S, L, and T—appear on the instrument, as well as linear and metric measures. The CI scale is printed in red for easier reading. An adjustable stainless-steel frame holds the glass hair-line indicator. With the rule comes a carrying case and a rule book.

The Charles Bruning Co., 4754-10 Montrose Ave., Chicago 41, Ill., will be glad to furnish readers of CONTRACTORS AND ENGINEERS MONTHLY with details. Just mention this item.

Shoulder Stabilized, Mulched and Seeded

(Continued from preceding page)

are variations in treatment of seed; the type of fertilizer used; the technique, season, and rate of seeding; the depth of mulch and of soil cover of the seed; and various types of mulches. The study is a continuation of similar tests made during 1945.

Personnel

This roadside-development work, embracing both shoulder stabilization and grass seeding, was done with a crew of 7, including 2 equipment operators and 5 laborers, under the direction of Harry H. Iurka, Landscape Architect. The work is part of the regular program of maintenance and improvement of shoulders and slopes along the highways of District 10, New York State Department of Public Works, which is headed by J. J. Darcy, District Engineer with headquarters at Babylon.

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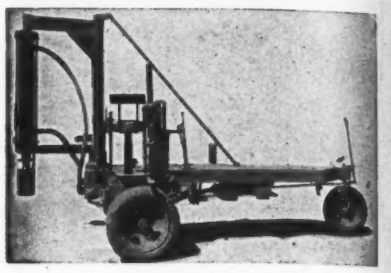
Good for all Small Jobs



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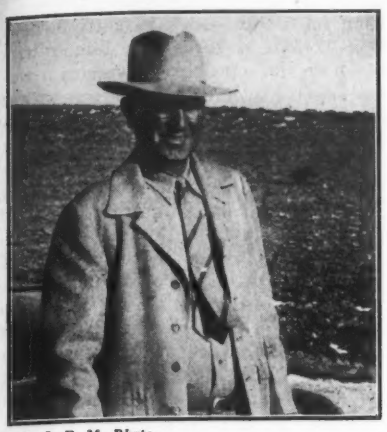
At Left: It's a TD-18 TracTracTor cutting out a roadway on a hillside with a bullgrader blade. Wherever roads are built, Internationals speed the job, help keep costs down to bedrock.

Below: An International TD-9 and two-wheel hydraulic-control scraper on a road job; one of the most versatile and useful of tractor-scraper combinations.

INTERNATIONAL Industrial Power



C. & E. M. Photo
Superintendent O. D. Cowart directed the preparation of crushed aggregates for the Denison & Martin 19-mile road-mix project north of Hobbs, N. Mex.

Caliche Base Used On 19-Mile Road Job

(*Continued from page* 1)

the huge Army Air Base 7 miles out of Hobbs. Since it is a part of U. S. Highway 62 and New Mexico State Road 18, it will carry transcontinental traffic connecting with U. S. 70 northward, or U. S. 80 southward.

The job was started September 15, 1945, under a New Mexico State Highway Department contract with Walter L. Denison and G. I. Martin, both of Albuquerque. They are operating jointly under the name of Denison & Martin. A time limit of 275 working-weather days was set on the $308,000 project. The total length of FAP 197-A, which involves grading, removal of existing pavement, and new resurfacing with asphaltic road-mix, is 19.028 miles.

In calling for bids, the New Mexico Highway Department had broken the job down into the following principal items:

Unclassified excavation	197,854	cu. yds.
Structure excavation	775	cu. yds.
Sheepsfoot rolling	2,920	hours
Steel rolling	829	hours
Water for processing	5,863	M-gals.
Galvanized barbed-wire fencing	92,230	lin. ft.
Leveling course surfacing	67,343	tons
Cut-back asphalt, MC-1	1,763	bbls.
Top-course surfacing	20,538	tons
Cut-back asphalt, MC-3	7,824	bbls.
Mixing asphalt and aggregate	19.028	mi.
Preparation of subgrade foundation	19.028	mi.
Concrete-pipe culvert	2,882	lin. ft.

Several provisions regarding the sequence of operations were stipulated in the contract. They caused the Superintendent on the job a not-inconsiderable amount of head scratching before he was able to comply and still use all his equipment to the best advantage. The routing of traffic came first in these calculations. Under the terms of the specifications, not more than 2 miles of the road could be torn up at any one time, and only half the total width could be processed. The other half had to be left open to traffic until the subgrade had been cut or filled to finished grade, and was ready for the road-mix. Only then could Denison & Martin route traffic over the subgrade and start work on the other half section. Moreover, all work had to be finished within the 2 miles being processed before the next 2-mile stretch could be worked.

The job was also laid out so that borrow material for all the top courses and most of the fill had to be hauled from borrow pits 500 feet on the east side of the highway. All material excavated in the cut sections was used in fills. This was all rocky, and every foot had to be blasted, including all borrow pits. There was a reason for selecting these pits where blasting was necessary. It was the fact that borrow material for this job had to meet rigid specifications regarding liquid limit and plasticity index. When the job was designed, a comparison was made between available uncontrolled borrow material, and material in which the liquid limit and plasticity index were controlled. It was found that uncontrolled borrow exceeded the cost of controlled material, because ballast to support the load was needed with the uncontrolled and not with the controlled. According to the contract price for this job, approximately $40,000 was saved by the method adopted, even though it involved blasting.

A detailed list of equipment available was furnished with the successful bid by Denison & Martin. Under the contract, they could expect no help in obtaining new earth-moving machines. This firm of contractors, however, had been quite active in war contracts in New Mexico, and had an ample supply of tractors, scrapers, rippers, power shovels, and so on. These machines were all nearly new, and were in excellent condition.

Start of Work

Work began officially on September 15, 1945, when six Caterpillar D8 tractors were brought in, each machine towing a LeTourneau Carryall. Models FP, YR-12, and K were used. Two D8's with bulldozers and one D8 with a single-tooth heavy-duty Wooldridge cable-controlled ripper were unloaded to help break up the surface formation and load Carryalls. Two D7's were also used with the sheepsfoot rollers.

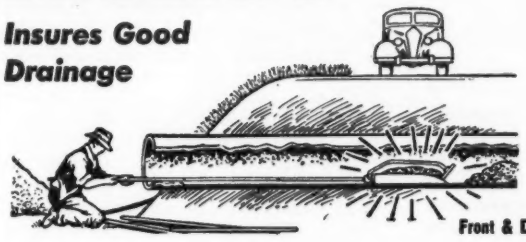
In cross section, the new right-of-way is 150 feet wide. Fill or cut sections will accommodate a new asphalt road-mix mat 24 feet wide throughout the 19-mile section. Shoulders vary from 8 feet on the lower to 4 feet on the upper or Lovington end. Side slopes of cut and fill sections are 4 to 1. The old road, all of which was on the same location as this new construction, had been only 18 feet wide, so the amount of earth work was considerable.

The D8-towed Wooldridge ripper had

(*Continued on next page*)

MORCO CULVERT CLEANER

Insures Good Drainage



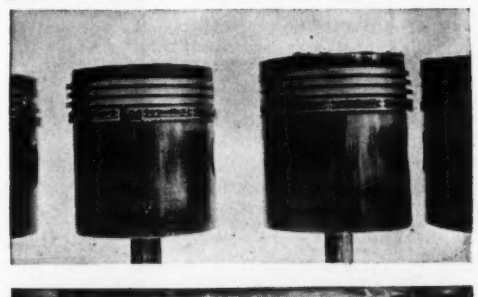
Restore clogged culvert pipes to service with the "Morco" Culvert Cleaner. Quick-acting, non-damaging, easy operating "Morco" is the most satisfactory tool yet developed for this work.

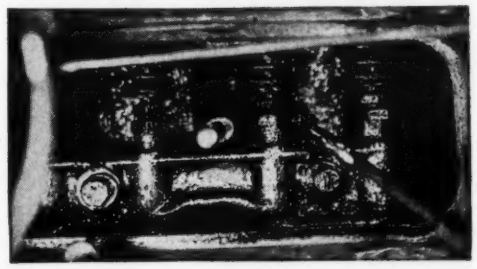
MONARCH ROAD MACHINERY COMPANY
Front & Douglas N. W., Grand Rapids 4, Michigan

Now clean up engines without tearing them down

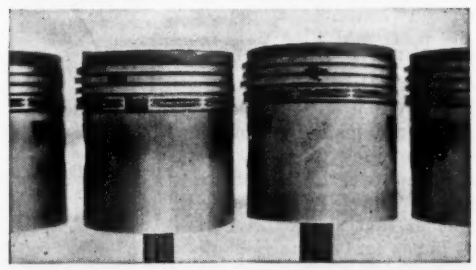
STANO-PURGE

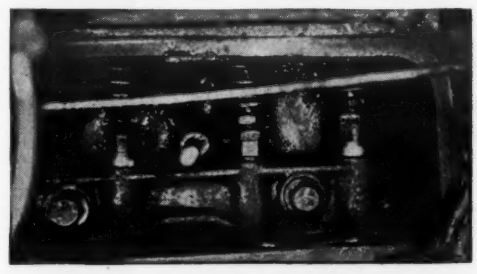
Before STANO-PURGE





After STANO-PURGE





HAVE YOU frequently wished for a really effective crankcase purging solvent? For example, when you know an engine is sludged but can't be spared for tearing down and cleaning? Or when delivery units, operating intermittently or with considerable idling, are sludging badly?

Stano-Purge will clean the crankcase, piston rings, oil screen and lines, and valve chamber. Only in cases when engines are extremely dirty and the oil screens badly clogged will it be necessary to drop the pan.

Stano-Purge has been thoroughly tested on many makes of gasoline engines. Some of the remarkable results are pictured here. Its effectiveness is the result of unusually high solvency and a detergent additive developed by Standard Oil. These properties combined with a high foaming action enable Stano-Purge to remove engine deposits.

A folder is available describing the application of Stano-Purge and further advantages. Send for a copy. Write the Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

Caliche Base Used On 19-Mile Road Job

(Continued from preceding page)

to be used ahead of practically all scraper loading. Even this failed when the solid, hard ledge of caliche and lime rock was uncovered beneath the surface of the ground. Five Ingersoll-Rand and Gardner-Denver wagon drills were brought in, with Gardner-Denver and Chicago Pneumatic compressors, to drill this rock to grade. Hole centers varied with the thickness of material and hardness, but averaged in general 6 feet on a grid system. About ¾ pound of 40 per cent free-run dynamite per cubic yard had to be used to break the rock.

The broken rock was then loaded by a Bucyrus-Erie 37B shovel, using a Red Arch 1½-cubic-yard bucket. Its four teeth and digging lip were reinforced with hard-facing rod. This shovel was used to load a fleet of 15 Ford, Chevrolet, and GMC 5-cubic-yard dump trucks which were rented on a per-hour basis. Trucks were used on hauls in excess of 1,300 feet; Carryalls hauled under that distance. Maximum hauls were seldom more than 1½ miles, for trucks.

Fills and Cuts

The specifications for fill were as rigid as contemporary highway requirements in any part of the United States. Fill material with a liquid limit of 35 or less, and a plastic index of 6 or less was called for. Earth weighing less than 120 pounds per cubic foot, standard dry density, had to be compacted in the field to 95 per cent plus of the ultimate standard laboratory maximum for that soil. If it weighed more than 120 pounds, compaction requirements were 90 per cent plus.

All cut material and all large lumps were placed in the bottom of fills in horizontal 6-inch layers. Large stones had to be scattered. The fill was constantly watched for nests or pockets of large material. The caliche had sufficient dust, red sand, and other fine binding material to pack satisfactorily under sheepsfoot rollers developing 300-psi pressure. Even so, the moisture content was controlled within an upper limit of optimum, and a lower limit of optimum minus 5 per cent by weight. Some rain and snowfall while embankments were being built affected the fill. But in general, New Mexico at Hobbs is arid, and water-tank trucks owned by the contractor had to be used.

The embankments were built up after rooting the old bituminous paving, scarifying the base, and then re-compacting the top 6 inches. After the main part of the new fill had been built, a special topping, from 3 to 8 inches compacted thickness, was made by crushing caliche and lime rock; it was then leveled and rolled to bring the fill to final elevation. The fill was turned over to traffic at that stage. In February, about 75 per cent of the embankment had been finished. No seal coat or road-mix could be applied before April 1, when air temperatures are likely to be greater than 50 degrees F.

Caliche-Crushing Plant

A portable rock-crushing plant was set up on this job to turn out subgrade topping and road-mix aggregate at low cost. Borrow pits for caliche and lime had been designated by the State Highway Department, and the plant was set up beginning at the Hobbs end of the project. It moved north with the work.

As was the case with highway cuts and borrow pits, all material for this plant had to be shot. A Chicago Pneumatic wagon drill, using detachable bits on 6 to 10-foot steel, was powered by a Gardner-Denver 210-cfm compressor. Free-run 40 per cent dynamite was used at the same explosive ratio as on road cuts. When shots were fired by electric blasting caps, the material was ready to start through this crusher.

C. & E. M. Photo
Crushed caliche was used for fill on Denison & Martin's 19-mile road-mix project on U. S. 62 in New Mexico. Work was carried on on half the road at one time so that traffic could be routed through the job.

Two Caterpillar D8 tractors with LeTourneau XD-8 bulldozer blades moved it to a Pioneer 10-foot traveling feeder hopper. From there it passed to a Diamond 15 x 36-inch primary jaw crusher, powered by a Caterpillar D13000 stationary diesel engine.

A 30-inch conveyor belt 130 feet long then moved the rock to a triple-deck 4 x 12-foot screen, with 1-inch wire mesh on the top deck. Oversize material passing over this shaker screen was by-passed through a Diamond 40 x 22-inch roll crusher, and brought back over the screens for further classification. The roll crusher and screen unit were powered by a Caterpillar D17000 engine and a flat-belt drive.

Excess dust caused by the crushing of caliche was taken out of the material at the bottom of the last screen, before the remainder of the crushed rock moved out to a 20-cubic-yard steel bin. In crushing New Mexico caliche almost anywhere in the state, an excess amount of dust and fine material accumulates, according to Project Superintendent O. D. Cowart. Caliche weighs only 2,300 to 2,400 pounds per cubic yard, which means that a considerably greater volume per ton must be handled than is the case with heavier rock. Caliche is not hard on crushers, and not too abrasive on the remainder of the plant.

(Concluded on next page)

If
IT'S TOP YARDAGE YOU WANT
Mister
A
MARION
WILL GIVE IT TO YOU AND . . . MORE.
What is Your Problem?
Everything a contractor could ask for in a power shovel — to make short work of every contract — is built into the modern MARION to make it today's soundest investment in top yardage. It is fast . . . . . powerful . . . . . full of action in every movement . . . . . versatile . . . . . easy to operate . . . . . sturdily constructed for rugged service . . . . . and incorporated with the latest engineering features that years of experience have proven as practical. These are the things you get when you buy a MARION.
MARION
POWER SHOVEL COMPANY
MARION, OHIO, U. S. A.
Offices and Warehouses in all Principal Cities from ¾ cu. yd. to 40 cu. yds.
Note: Marion Power Shovel Company — Formerly The Marion Steam Shovel Company — Established 1884.

Caliche Base Used On 19-Mile Road Job

(Continued from preceding page)

The portable plant in use here has turned out 200 tons of crushed material an hour for an 8-hour shift per day. It was assembled in the Denison yard. Especial care was taken to make all the parts of this plant which were likely to need repair or replacement accessible to the plant operators.

When the plant turned out subgrade topping, eight dump trucks rented on a ton-mile basis hauled from the 20-cubic-yard bin to the job. Superintendent Cowart made up all the road-mix aggregate he was likely to need, and stockpiled it before he moved on to the next pit with his plant. When he stockpiled aggregate, he of course moved the bin out of the way and kept the material pushed aside by one of the D8 bulldozers ordinarily in use in the pit.

Grading requirements, which were adhered to strictly, were as follows:

Leveling Course (Subgrade Topping)	
Size Mesh	Per Cent Passing
1 inch	100
No. 4	25-40
No. 200	5-10

Grading specifications were the same for road-mix aggregates.

Road-Mixing

Although road-mixing of aggregate and liquid asphalt did not start until April, plans for this phase of the work and the machines to perform it were ready well in advance. It was first necessary to dress and roll the leveling course, after traffic had used it for several months.

A prime coat of MC-1 cut-back asphalt was heated to from 100 to 175 degrees F. It was applied by spreader bar at the rate of 0.25 gallon per square yard. This seal coat was then allowed to stand for at least 24 hours to allow it to penetrate.

Crushed aggregate from the stockpiles was spread by motor graders. Then MC-3 cut-back asphalt, heated from 175 to 250 degrees F was applied by spreader bar at the rate of 1.2 gallon per square yard. This oil was heated by a portable Cleaver-Brooks tank-car heater. The aggregate and hot asphalt were mixed by blading back and forth across the complete roadway width at least twice, using the three Caterpillar No. 12 motor graders on the job. The specifications called for the mix to be bladed "until it has a uniform color, free from fat spots, uncoated particles, and balls".

After the material was mixed and leveled, it was checked with a 10-foot straight-edge. No deviation greater than ¼ inch was permissible in that distance. After it was checked for grade, the mix was then smooth-rolled by a Galion tandem roller weighing 8 tons. When this job was visited for CONTRACTORS AND ENGINEERS MONTHLY, it was expected that the paving would be finished well ahead of the scheduled completion date of May 1, 1946.

Personnel

In addition to Mr. Cowart, the contractor was represented by G. I. Martin, with Jack "Old Beartracks" Burchett as Grade Foreman.

Phil Johnston was Project Engineer and T. B. White, District Engineer for the State Highway Department of New Mexico. F. G. Healy is New Mexico's State Highway Engineer, with headquarters in Santa Fe.

Four New Davey Dealers

Three new eastern dealers have been appointed by the Davey Compressor Co., Kent, Ohio. They are: C. A. Lippincott & Bro. Co., Morristown, N. J.; Jones-Rogers Co., Cleveland, Ohio; The Phillips Machinery Co. of Baltimore, Md., and Richmond and Alexandria, Va.

Portable and stationary air compressors, truck power take-offs, portable lighting units, power timber saws, and other Davey equipment are now being handled in southern Texas by the H. W. Lewis Equipment Co., San Antonio, the Davey Compressor Co. has announced. The Texas dealer will also provide complete parts and service facilities.

C. & E. M. Photo
Denison & Martin used this portable crushing plant to produce crushed caliche for surface topping and aggregate for road-mix.

Couples Pipe Without Threading, Flanging

Water-supply and fuel-oil lines, and similar installations of pipe less than 12 inches in diameter, can now be coupled without threading, grooving, or flanging, the Gustin-Bacon Mfg. Co. has announced. The firm markets a coupling for plain-end pipe that eliminates conventional pipe-coupling methods.

Known as the Rolagrip, the new coupling comprises a rubber gasket and a two-part housing. The gasket is slipped over the ends of the sections of pipe to be joined, and the housing fitted over the gasket where bolts hold it tight. Built-in steel rollers grip the pipe, and their adjustment to normal expansion or contraction imparts controlled flexibility to the joints.

Working pressures up to 1,000 pounds per square inch can be maintained with regular sizes serving pipe of 1½ to 12-inch size; super sizes, with working pressures up to 2,000 pounds, are made for 3 and 4-inch pipe, and tube sizes are available for outside diameters of 3¼ to 7 inches.

Literature describing these couplings can be obtained by writing the Gustin-Bacon Mfg. Co., 1412 W. 12th St., Kansas City 7, Mo., and mentioning this news item.

Handles Western Sales

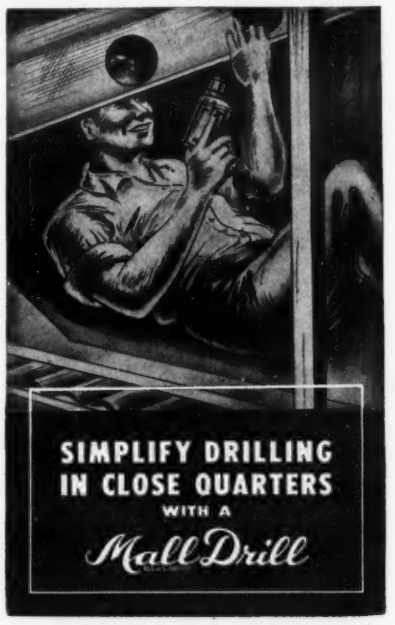
Robins Conveyors Division of Hewitt-Robins Inc. has announced that R. W. Eichenberger, Vice President of the firm, has moved to the Chicago office to supervise sales in the Western Division. Associated with the firm since 1910, he has been in charge of engineering at the Passaic, N. J., headquarters. He will be assisted in the Chicago office by E. P. Larsen.

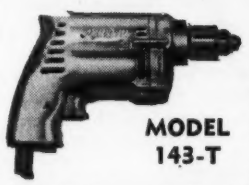
Dump Trucks Described

Superseding the company's previous bulletins and containing more complete specifications and technical information, two new bulletins have been issued by the Euclid Road Machinery Co. to describe its bottom-dump and rear-dump trucks.

Form 101 features the Model F rear-dump Euclid for off-the-road hauling. This truck has a 15-ton capacity and a top speed of 22 mph when loaded. The bottom-dump Euclid, described in Form 201, has a maximum 26-mph speed when carrying a 40,000-pound payload.

Both these new brochures, Forms 101 and 201, can be secured by readers of this magazine who mention this news item when writing the firm at Cleveland 17, Ohio.





MODEL 143-T

The compact design of the ¼" MallDrill makes it easy to handle in close quarters and cramped positions . . . its perfect balance permits operation with either hand . . . and its light weight reduces the worker's fatigue.

Equally efficient on metal, wood or plastic, the MallDrill is designed for constant duty. Its powerful high speed motor is cool running and will not stall in hand drilling. Special steel alloy gears, and extra long brushes make for long service. Commutator and brushes can be serviced without dismantling the drill.

The ¼" MallDrill comes in 2 speeds—Model 143T 2500 r.p.m.—Model 143TP 1700 r.p.m. Available for 110-volt AC-DC or 220-volt AC-DC.

The ½" MallDrill has free speed of 500 r.p.m., and is tailor-made for heavy duty drilling. It has a ½" capacity in metal and 1" capacity in wood. It is equipped with powerful, ballbearing motor, steel alloy helical gears and the finest chucks. Its streamlined appearance is designed for peak efficiency and service. Also 5/16" and ⅜" models. All MallDrills have universal motors.

Ask your Distributor for MallDrills, MallSaws, Mall Concrete Vibrators, and Mall Chain Saws or write direct for literature and prices.

MALL TOOL COMPANY
7743 South Chicago Avenue
Chicago 19, Illinois

★ 25 Years of
"Better Tools For Better Work"

Tractor rims worn?
With our to-the-point printed instructions any experienced welder can do the job quickly and correctly.

IF SPROCKET teeth are worn, but the expensive hub is still in good condition, why not follow the example of hundreds of modern operators and weld on a Pacific Manganese Steel Rim. Any experienced welder can torch through the old spokes, match on the new rim, and weld it in position — right in the field if desirable. The result is a better rim because the tough, wear-resistant MANGANESE STEEL Rim will last longer and by salvaging the hub and spokes you have made a substantial saving.

A new bulletin gives all details — tells also about Pacific Renewable Idler Wheel Rims. Ask for your copy.

ALLOY STEEL & METALS CO.

Spring brings out road maintenance crews all over the country. Here ditches are being cleaned and the crown reshaped with an Allis-Chalmers W Speed Patrol.

Power Control Units For Tractor Equipment

Hydraulic power control units for equipment used in conjunction with tractors are made by the Be-Ge Manufacturing Co. of Gilroy, Calif. Manufactured in single and dual-valve models, the units are said to be easily attachable to any tractor. They can be assembled for either right or left-hand drive.

The largest Be-Ge power control unit, Model 650B, has a working pressure of 850 psi. It has a volume capacity of 46 gpm at 850 rpm, when running at zero psi with SAE 20 oil at 160 degrees F. At 500 psi this drops to 41 gpm.

Smaller Be-Ge's, Models 1,000 and 1,400, meet the demand for a lower-price unit where volume requirements permit the use of a lower-capacity pump. Also adaptable to either right or left-hand drive, they can be furnished with one or more control valves. Model 1,000 has a 31-gpm volume capacity at 850 rpm, zero psi with SAE 20 oil at 160 degrees F. Model 1,400 has a 22-gpm capacity under the same conditions.

The firm also makes a special valve attachment for John Deere Models A, B, or G, and for Farmall M and H. Special power control units are also available for J. I. Case tractors.

Specifications and further details about Be-Ge power control units, pump assemblies, and adapters can be obtained from the manufacturer on mention of this notice. Specify the make and model of tractor on which the unit is to be used.

Sawhorse Folds Up

Space-saving features characterize a new sawhorse that has been patented by the Unique Tool Products Co. of Chicago. The unit folds down to a convenient 8 x 9 x 42-inch size.

Said to be as sturdy as any standard one-piece horse, the Fold-Horse has the usual 2 x 6 x 42-inch clear white-pine top. It features a 9 x 36-inch tool tray suspended between the legs. Cadmium-plated 14-gage steel hardware is used throughout, and is said to be of such design that it will not loosen with usage.

The Fold-Horse will be sold through jobbers. Information and prices can be secured on mention of this notice. Write to the firm at 4632 No. Clark St., Chicago, Ill.

Ventilating Outfit Is Small, Portable

Cool air and ventilation for temporary buildings and shops on the construction site or for work in tunnels, sewers, or other close areas, can be provided by a device made by the Herman Nelson Corp. of Moline, Ill. A self-powered ventilator, it was developed for tropical wartime use and is said to be adaptable to various construction applications.

The outfit comprises a high-capacity fan powered by a lightweight gasoline engine or electric motor. To this is attached a wire cage containing a collapsible directional air duct, 14 inches in diameter and 16 feet long, made of heat and water-resistant material. The unit is mounted on a light tubular metal frame equipped with two rubber-tired wheels, and weighs but 87 pounds. Air delivery is adjustable up to 4,500 cubic feet per minute.

Further details about the Herman Nelson self-powered ventilator can be secured by request to the manufacturer at Moline, Ill.

KEEP WEATHER OUT—PROFITS IN

These tough, all-weather tarps pay for themselves over and over again. You can use them on job after job. Rope holes are triple reinforced, lined with brass grommets. The canvas is permanently "pressure impregnated" with Fulton's exclusive weather and mildew treatment.

Fulton tarps come in standard sizes, and for your convenience are sold through appointed dealers. There's a size for every use, a thousand uses for every size. See your building supply dealer.

FULTON BAG & COTTON MILLS
Manufacturers Since 1870
New Orleans • St. Louis • Dallas • Kansas City, Kans.
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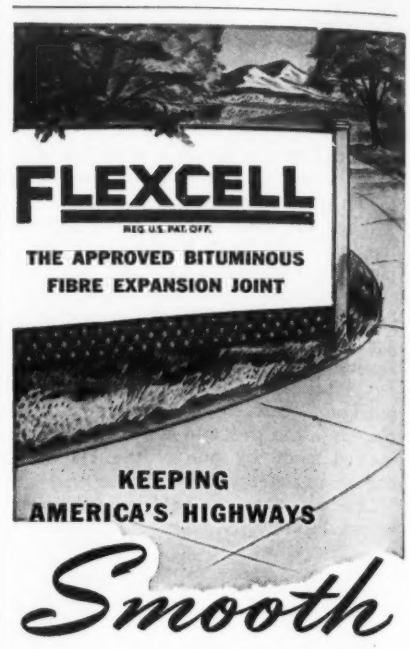

Smooth

● FLEXCELL, made of long Celotex springy fibres, is the *approved* modern expansion joint for all highway and general concrete slab construction.

● Keeps highways smoother because it never extrudes. Compresses under pressure. Springs back when the expansion pressure is eased. Can be set flush—or set below the slab surface with poured capping.

● It's light, easy to handle. Helps make concrete roads last longer. Proved by years of service on American roads—with "never a bump in a million miles."

Write for sample and complete information.

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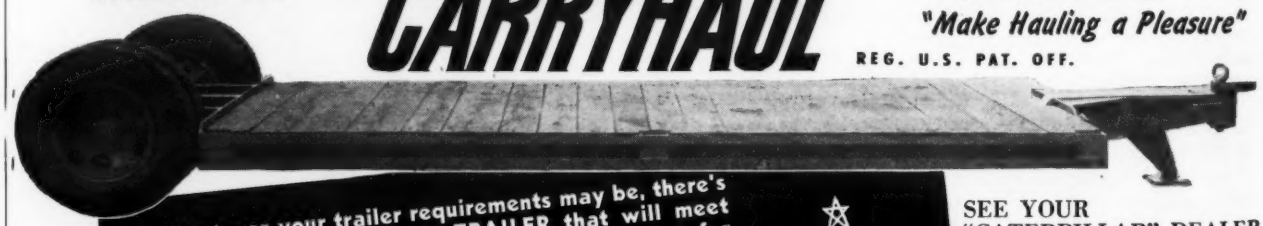
Dept. CEM 6, Chicago 3, Illinois
World's Largest Manufacturers of
BITUMINOUS FIBRE EXPANSION JOINT

MARTIN CARRYHAUL TRAILERS . . .
"Make Hauling a Pleasure"
REG. U.S. PAT. OFF.

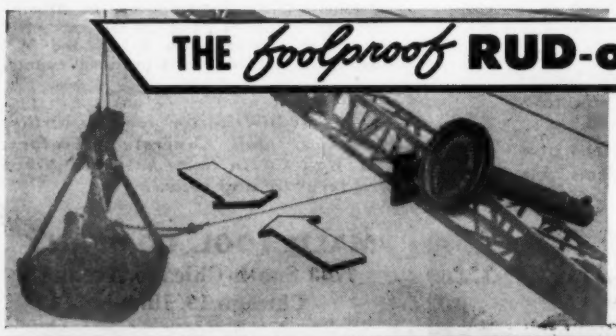


Whatever your trailer requirements may be, there's a MARTIN CARRYHAUL TRAILER that will meet them squarely. MARTIN TRAILERS are known for their ease of loading, strength, safety and economical operation. 'Cross town or 'Cross country —let MARTIN CARRYHAULS carry the load for you.

SEE YOUR "CATERPILLAR" DEALER

MARTIN MACHINE CO.
KEWANEE, ILLINOIS

THE foolproof RUD-o-MATIC TAGLINE



★ Spring tension keeps bucket steady
★ No weights, tracks or carriages
★ Fewer sheaves saves cable wear
★ Easily installed in 30 minutes
★ Your Equipment Dealer can supply you

"IT'S THE STURDY FOOLPROOF COIL SPRING"

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CONTRACTORS WANTING BLDG. BRICK & TILE

A graduate ceramic engineer, 26 years' experience in manufacture of face brick and building tile, wishes to contact a Building Contractor or Building Supply Company desirous of purchasing a face brick plant for own use. Will operate same on commission per M basis. Thoroughly competent, can build new plant or recondition old, manager of brick and tile plants for last ten years. Employed at present, perfect health, age 45.

Address: Box 264
Contractors & Engineers Monthly
470 Fourth Avenue, New York 16, N.Y.

The American Con-Vay-It is designed for the speedy delivery of concrete.

Conveyor Cuts Costs In Pouring Concrete

Wet concrete can be placed at the rate of from ½ to 1 cubic yard per minute with its new portable conveyor, the American Conveyor Co. states. The unit will pass concrete horizontally, down, or up to an over 8-foot lift, eliminating the wheelbarrow method of delivery.

Known as the Con-Vay-It 12-20 Concrete Special, the conveyor is 20 feet long and has a 12-inch belt. It is mounted on 400 x 8 pneumatic tires, and is powered by a single-phase motor. A hopper arrangement can be mounted on the end for loading from ready-mix trucks or mixers. The units can be used in tandem for travel distances greater than 20 feet, and there is a special High Boy attachment for raising and lowering the discharge end. Other items besides wet concrete can be handled by the Con-Vay-It.

Details concerning this unit and its wide variety of possible uses can be obtained by readers of this magazine who write the American Conveyor Co. at 1125 W. Adams St., Chicago 7, Ill. Just mention this news report.

Paving-Products Catalog

Paving joints, joint-sealing compounds, concrete-curing compounds, and other Keystone products for concrete-paving construction are illustrated and described in a new 16-page catalog issued by the Keystone Asphalt Products Co. Engineering data and operational advice feature the booklet. A 4-page supplement, also available, gives the standard specifications for testing Kapco concrete-curing compound.

The 1946 Keystone catalog and specification K-1050 are available to readers of CONTRACTORS AND ENGINEERS MONTHLY on request. Mention this notice when addressing the firm at 43 E. Ohio St., Chicago 11, Ill.

Dustproof Feature For Levels, Transits

A transit and two new engineering levels, a wye and a dumpy, are being offered by the Brunson Instrument Co. All are built with the Brunson instrument base which features a dustproof ball-bearing spindle and socket.

Each of the new levels has an 18-inch telescope and an erecting eyepiece with 32-times magnifying power. The telescope has an internal focusing system, with rack and pinion adjustment, while the eyepiece uses spiral adjustment. Cylindrical bronze slide bearings are honed to close tolerances to obviate the need for lubrication. The 10-inch level bar has a 30-second sensitivity. Accessories for the levels include a top-opening mahogany carrying case; a standard 8-thread stiff-leg tripod; and other standard items.

The transit, Model 50, has a 10½-inch telescope with 22-times magnifying power; a 5-inch vertical circle; a 6¼-inch-diameter horizontal limb; and the other features of the Brunson instrument head. Solid silver gradations read to one minute on the vertical circle and horizontal limb. The latter is figured counter-clockwise as well as clockwise.

Brunson's instrument base, available in new or rebuilt instruments, is dustproof, and is free-revolving in any temperature.

Literature describing the new Brunson levels and transit, and the firm's service of instrument-head installation, can be obtained on request. Mention CONTRACTORS AND ENGINEERS MONTHLY when writing the Brunson Instrument Co., 1405 Walnut St., Kansas City 6, Mo.

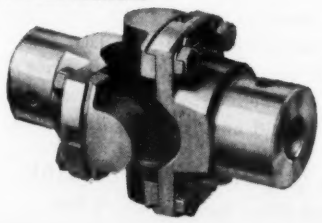
New Rubber-Goods Dealer

A. R. Bradshaw, Pacific Slope Manager, and R. G. Hueman are to supervise the distribution of Manhattan industrial rubber products through the Republic Supply Co. of California, Raybestos-Manhattan, Inc., has announced.

Help Keep "Stackers" on the Job

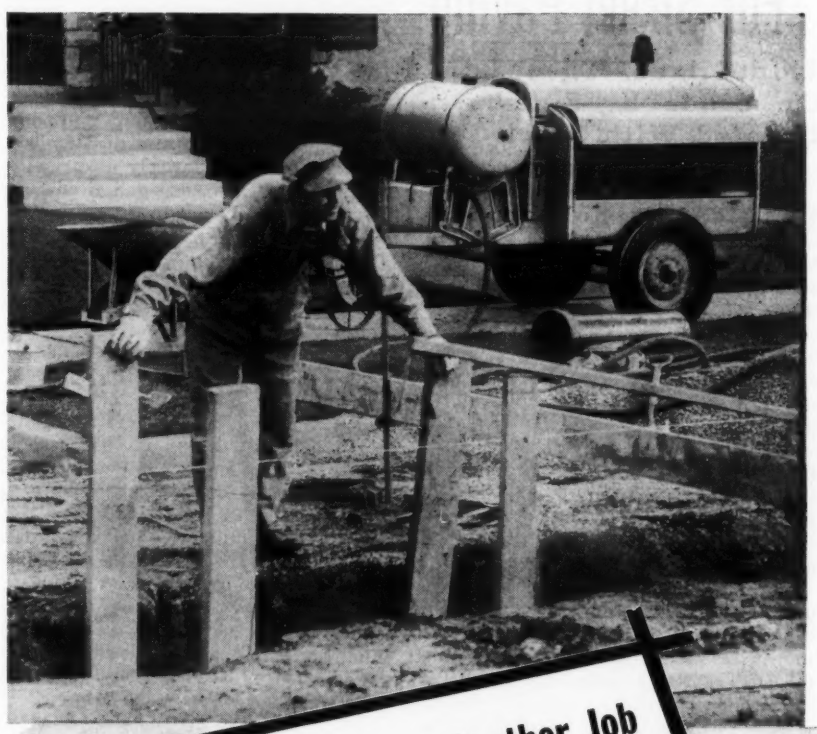
The once-a-season lubrication feature of MECHANICS Roller Bearing UNIVERSAL JOINTS makes frequent stops for this purpose unnecessary. This helps avoid delays and breakdowns caused by insufficient lubrication.

MECHANICS Roller Bearing UNIVERSAL JOINTS are available in single, double and close-coupled types in all sizes suitable for applications requiring from 200 to 50,000 foot pounds torque.



Let our engineers show you how the infrequent lubrication and other advantages of MECHANICS Roller Bearing UNIVERSAL JOINTS will benefit your new models.

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner • 2026 Harrison Ave., Rockford, Ill.



. . . Looking Over Another Job Well Done with an Economical, Dependable LE ROI Compressor

When there's a job of supplying air, Le Roi Compressors always do it well. Le Roi engineers saw to that when they designed into these units the sturdy, balanced crankshaft mounted on large tapered roller bearings; force feed lubrication; effective air cooling; alloy steel connecting rods; heavy-duty, self-adjusting clutch; large tube and fin type intercooler and a spring-cushioned towing eye for smooth, high-speed towing.

Le Roi compressors are the only ones in which both engine and compressor are built by the same manufacturer — for greater precision and longer life. Sum up all the features, and the answer is more air at lower cost with Le Roi. Available in sizes from 60 to 500 c.f.m. See your nearest Le Roi distributor for further details or write for bulletins.

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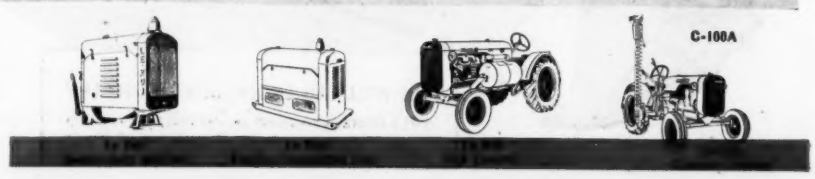

On a recent street-paving contract in Charleston, S. C., a Haiss bucket loader delivered excess material from the subgrade to trucks, which hauled it away from the job.

Sand-Asphalt Base For Street Paving

Plant-Mixed, Then Laid On Grade by Finishers; Covered With Black-Top Wearing Course

✦ A RECENT street-paving contract in Charleston, S. C., in which a sand-asphalt mix was used for the base course, constitutes a break with tradition in that city. There, practically all base courses have been constructed of a 5-inch layer of concrete, on top of which a 3-inch asphalt surface course was usually laid. As new housing developments were constructed, the need for added street improvements also grew. But since the houses were of the relatively low-cost type, city officials felt that they could be served with something less expensive than the traditional concrete-base asphalt-surface street.

However, a city ordinance did not permit the construction of any other type of pavement. So Charleston had to pass a special ordinance to permit the letting of this contract to pave 8½ miles of streets in a newly developed residential area with a 4½-inch sand-asphalt base, topped by a 1-inch asphalt wearing surface. On streets where buses operate, this section was deepened to a 5-inch base with a 2-inch top. A total of 155,000 square yards of pavement was included in this contract awarded to Dickerson Co., Monroe, N. C., at a cost of about $1.33 per square yard. As most of these streets already have curb and gutter, the contract did not include these items.

Grading

Dickerson Co. began operations by bringing the earth sub-base to grade at elevations controlled by the height of the existing curb. Two Caterpillar power graders did this work. Where catch basins and manholes were encountered, the contractor boarded over them and paved on top of them. This pavement was later cut out and the catch basins were built to grade.

Certain spongy areas had to be replaced with more suitable material. However, water and gas mains were so close to the surface that it was impossible to scarify the ground with power equipment; slower hand labor was therefore used. A Haiss bucket loader delivered the excess material into trucks which hauled it away.

Continuous Mixer

To mix the asphalt and sand, the contractor used a new Barber-Greene heavy-duty Model 848 continuous mixer, completely portable and equipped with a double drier and a dust collector. This plant is entirely electrically driven and has a 15,000-gallon storage tank for asphalt, and a 10,000-gallon tank for fuel oil to supply the drier torch. A 100-hp boiler heated the asphalt and also atomized the fuel oil to feed the drier torch. A total of 12,000 tons of sand was stockpiled at the plant to give an operating margin of about two weeks. The sand was excavated from a pit by a Lorain truck crane, and loaded into trucks which hauled it to the stockpile at the plant. This truck crane was used in excavation and also put to work on some other jobs that the contractor had in the vicinity. At the plant a Caterpillar D4 tractor-dozer pushed the sand towards the elevating buckets of the mixer.

The sand used in the base course had a Florida bearing test of at least 35 pounds and had the following characteristics:

Screen Size	Per Cent Passing
No. 4	80-100
No. 200	0-20

The asphalt cement combined with this soil was of 60-70 penetration, and the mix provided 4½ to 6 per cent non-volatile bitumen. The actual mix that the contractor used was 5.1 per cent; tests show that this figure produces a peak density. The mix had an average temperature of 260 degrees F.

Base and Surface Courses

Two Barber-Greene finishers laid the base course in strips 10 feet wide. To obtain a 4½-inch depth, the contractor laid the mix 5 inches thick and rolled it 8 hours later with a Buffalo-Springfield 10-ton roller. A pneumatic-tire roller was also available when conditions required its use. Rolling proceeded until

(*Concluded on next page*)

Watch the LOADS Go By!

. . . for faster earth moving

Brooks LOAD LUGGER Trade Mark Reg

Get record speed and economy in quarry operations, road building, stripping overburden, excavating and general construction work by using the LOAD LUGGER with 5 to 10 detachable dump buckets.

This method saves time, conserves manpower and enables one truck to do the work of many. Unit mounts on any standard truck chassis. One-man controlled. Only 15 seconds for loading or dumping.

Bucket capacities 1½ to 4 cu. yds.

Write for Catalog No. 46

Brooks EQUIPMENT AND MFG. CO.

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Distributors in all Principal Cities

BITUVIA Plant Mix

For
- RESURFACING OLD CONCRETE ROADS
- PATCHING CONCRETE AND BITUMINOUS ROADS
- WEARING SURFACES OF ROADS, AIRPORTS, DRIVEWAYS, PARKING AREAS

● BITUVIA Plant Mix is a flexible product, with a number of uses. It is especially useful for early-in-the-year patching, as it sets up uniformly, can be rolled or tamped shortly after laying, and requires a minimum amount of application labor.

The illustration above shows a road built entirely of REILLY BITUVIA, with a BITUVIA stabilized base, BITUVIA plant mix wearing surface, and a seal coat of BITUVIA RT-10. This road, built in 1943 to serve a large war plant, has carried unusually heavy traffic from the day it was completed. Over the three-year period it has required no expenditure for maintenance and today shows little evidence of wear.

Further information on the use of BITUVIA Plant Mix will be furnished on request. Write for the BITUVIA pocket-size manual, containing valuable road construction data.

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THE WELLMAN ENGINEERING COMPANY

7012 CENTRAL AVENUE • CLEVELAND 4, OHIO

On the Dickerson Co. street-paving contract, W. L. Howerton, at right, was Superintendent; and Roy Roscoe, at left, was Inspector at the asphalt plant for Parker Laboratories.

Street Paving

(*Continued from preceding page*)

the base attained a density of 95 per cent of the optimum. This figure was approximately 114 pounds per cubic foot. Only one pass with the roller was required, in addition to the natural compaction that traffic would give the base.

After about 6 weeks the base was covered with the asphalt surface course. Before the surface course was laid, a tack coat of asphaltic cement was applied to the base at the rate of 0.15 gallon per square yard. The Barber-Greene finishers also laid the surface course, operating at a rate of 10 to 20 feet per minute. The equalizing runners on the finisher were used to adjust the grade and to confine the edges of the mix. When longitudinal and transverse joints were required, the contractor took particular care to make them in a neat and careful manner, painting them with asphalt if required. After the wearing surface was rolled, it was opened to traffic.

This surface course was made up of fine aggregate, coarse aggregate, and mineral filler. The fine aggregate consisted of sand from stone crushings, the coarse aggregate was crushed stone, and the mineral filler was either dry limestone or cement. Of the filler, 85 per cent passed the No. 100 screen and 65 per cent passed the No. 200 screen. The combined mixed aggregate was within the following limits:

Screen Size	Per Cent Passing	
	Light traffic: 1 inch thick	Bus routes: 2 inches thick
1½-inch	.....	100
1-inch	.....	84-99
¾-inch	100	77-99
¼-inch	87-100	66-84
⅜-inch	74-99	55-75
No. 4	57-69	42-68
No. 10	42-56	31-57
No. 40	24-34	16-36
No. 80	15-23	12-22
No. 200	4-8	4-8

To this aggregate mixture, from 6 to 8 per cent non-volatile bitumen was added for the light-traffic streets, and from 5.5 to 7.5 per cent bitumen for the bus routes.

The specifications gave the contractor a certain amount of latitude when he selected an aggregate mix from the limiting analysis shown. These variations were as follows:

Screen Size	Variation in Per Cent
No. 4 or larger	5
No. 10, 40, 80	4
No. 200	1
Bitumen content	0.25

A Barber-Greene finisher lays sand-asphalt base on the Dickerson Co. 8½-mile street-paving contract at Charleston, S. C.

Personnel

The work was performed under the direction of B. M. Thomson, City Engineer, assisted by Joseph Needle, S. P. Anderson, and John Stehmeyer. The mix was designed and the materials inspected by Parker Laboratories, Charleston, S.C., with Roy Roscoe serving as Inspector at the plant. W. L. Howerton was Superintendent on this project for the contractor and L. F. Mills was Superintendent at the plant.

TOUGH PUMPING JOBS

CARVER PUMPS are designed and built to stay on the job for hundreds of hours—always fast-priming and non-leaking—even when the water is filled with sand, silt or dirt. Mechanical seals have wearing surfaces made of tungsten-carbide—almost diamond-hard—and consequently are practically immune to wear. Impeller and suction head are also made of wear-resisting material to provide long life and efficient performance. Simple design and few working parts assure lower operating and maintenance costs. Carver self-priming centrifugal pumps are available in a wide range of capacities from 3,000 to 200,000 g.p.h. with gasoline, Diesel or electric power. Dealers in all principal cities.

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BUY *all the Bonds you can . . .*

KEEP *all the Bonds you buy*

Plenty of light *on the job,* with Onan Electric Plants

All the illumination you need for night operation . . . inside shovel cabs, spot-lighting dangerous obstacles, or flood-lighting entire work areas.

Onan plants have many advantages as a source of power for lighting *on the job.* Can be truck mounted, installed in or on construction machinery, or even carried by hand depending on size. Capacities range from 350 to 35,000 watts. Onan gasoline engine powered, they are easy to start. Built as a compact single unit with Onan generators direct-connected for permanent alignment.

Lighting is only one of many uses for Onan-generated electricity. Used extensively in the field for powering electrical tools, pumps and other motor-driven equipment.

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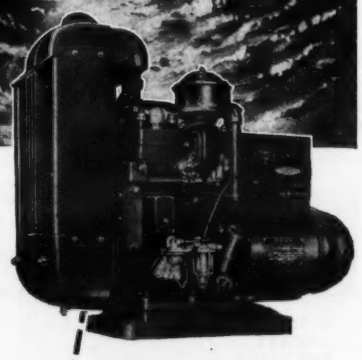

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PRIME MOVER: ONAN 4-cycle, one and two cylinder gasoline engines. Air or water-cooled. Four and six cylinder heavy-duty industrial engines on larger models.

GENERATOR: ONAN. Direct-connected to engine. Inherently regulated. Self-excited. Heavy-duty construction. Drip-proof.

STARTING: Manual, electric push-button at plant, remote control, or automatic.

CAPACITY RANGE: 350 to 35,000 watts.

ALTERNATING CURRENT: 115 and 230 Volts, 50 and 60 cycle. Single-phase for all capacities. 3-phase for models 3 KW or larger. Other voltages and frequencies available.

DIRECT CURRENT: 115 and 230 Volts, 600 to 10,000 Watts. 6, 12 and 32-Volt Battery Chargers to 3500 Watts.

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POWER & LIGHT FOR EVERY NEED
Onan
ELECTRIC PLANTS

The new Aeroil 4½-gallon spreading pot will handle chips, sand, gravel, and similar materials.

A New Spreading Pot For Varied Materials

A new pot for spreading chips, sand, gravel, slag, salt, calcium chloride, cinders, and similar materials has been announced by the Aeroil Products Co. Standing 15 inches high, the pot has a diameter of 10 inches. It will hold 4½ gallons of liquid material, or ¼ cubic foot of dry.

Known as the Aeroil No. 55, this pot has a big shovel opening and a comfortable carrying handle. The opening is adjustable and, combined with the big back handle, is said to give perfect "flow control". You merely set the gate, jiggle the pot a little, and the solids flow out to form a smooth, even coverage, Aeroil says.

This new item, and many other Aeroil tar and asphalt pots, buckets, and dippers, are shown in Bulletin 118-PW available to our readers on request. Write Aeroil Products Co., Park Ave. at 57th St., West New York, N. J., and mention this illustrated news item.

Portable Electric Tools

Maintenance shops, and other work in the construction and highway field, require many tools of the types illustrated in a new catalog issued by the Syntron Co. The 40-page booklet illustrates and describes the firm's entire line of electric-tool equipment, including portable hammers, drills, screw drivers, nut runners, grinders, sanders, and semi-portable hack saws. Accessories for these are also shown, together with specifications and prices.

Copies of the new catalog, No. 464, can be obtained by readers of CONTRACTORS AND ENGINEERS MONTHLY on request. Mention this notice when writing the Syntron Co. at 227 No. Lexington Ave., Homer City, Pa.

New Roller Bearing Has Improved Design

One of the "missing links" in the evolution chain of anti-friction bearings has been discovered by engineers of SKF Industries, Inc., according to a recent announcement. The firm has developed a new-type roller bearing able to carry heavier loads at higher speeds and lower temperatures.

It is known technically as a spherical roller thrust bearing. Its use is expected to facilitate maintenance and reduce operating problems in electric generators, dredge pumps, gear drives, and other applications of bearings in the construction-equipment field.

The bearing's self-aligning principle allows it to distribute heavy loads evenly over all rollers, and eliminates the danger of overloading, SKF says. This principle is said to compensate for any shaft deflections, distortions, or weaves. Built compactly, the new bearing uses less space and is lighter than conventional bearings.

Because of its unique design, the new bearing is said to permit more effective lubrication. Higher speeds are thus possible, SKF asserts. A cage retaining sleeve is pressed into the bore of the inner ring to make a contained assembly of the rollers, cage, and inner ring.

Further information on this new roller bearing can be obtained by writing SKF Industries, Inc., Front St., Philadelphia 34, Pa. Mention CONTRACTORS AND ENGINEERS MONTHLY.

Roebling News

The appointment of Ferdinand W. Roebling 3rd as Vice President in Charge of Engineering has been announced by the John A. Roebling's Sons Co., Trenton, N. J. He succeeds Charles M. Jones, who has become Vice President in Charge of Public and Industrial Relations. Both are directors of the firm.

Mr. Roebling served five years with the Army Engineers, and he retains the rank of Lieutenant Colonel in the Officer Reserve Corps. He is the third great-grandson of the firm's founder to be actively engaged in the management. Mr. Jones is a director of both the Trenton and the State of New Jersey Chambers of Commerce.

A modern office building and warehouse is being erected at 5525 W. Roosevelt Road, Chicago, by the firm.

New Engine Cleaners

Two new cleaning solvents for engines have been announced by the Standard Oil Co. of Indiana, Chicago, Ill. One, Stano-Purge, is designed to remove loose crankcase sludge and to clean oil screens and passages in the lubrication system. The other, Stano-Vim, purges the fuel-burning system, removing varnish, gum, and carbon deposits from valve stems, manifold, and intake-valve parts, as well as cleaning fouled spark plugs and combustion chambers.

Both products are said to have high solvency for the resins and gums formed through motor-oil deterioration, and low volatility with high flash point. They will be generally available at service stations soon.

"I realize those husky Sterling Wheelbarrows are not available today for immediate shipment — but they are certainly worth waiting for."

Men naturally prefer Sterlings because of their well-balanced construction and easy wheeling qualities. Sterlings speed up the material-transport job . . . make it possible to haul many additional loads each day. Right now, the demand for Sterlings greatly exceeds the supply. However, deliveries of tubular framed barrows are being stepped up as rapidly as conditions permit.

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Sterling WHEELBARROWS

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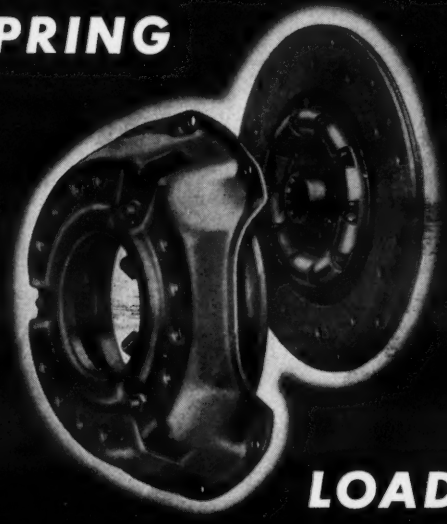

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* All ROCKFORD Spring-Loaded CLUTCH plates not only are carefully checked for accuracy of dimensions but are inspected on a rotary static balancing machine. Uniform operation, minimum wear, less-frequent adjustment and long life qualities of ROCKFORD Spring-Loaded CLUTCHES thus are protected during production.

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Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

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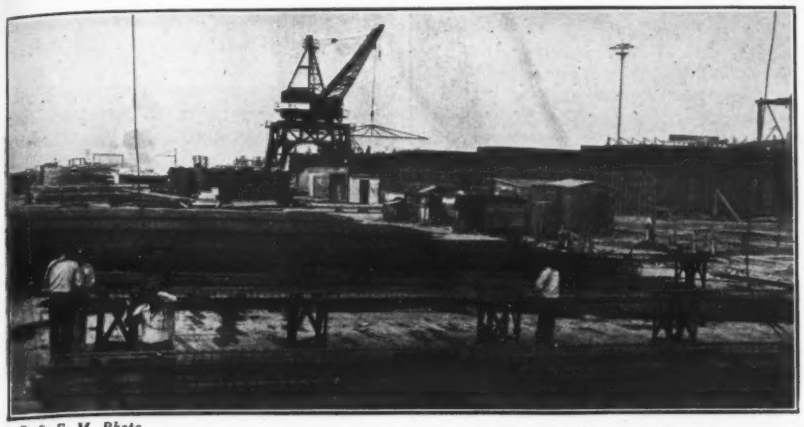


C. & E. M. Photo
In this general view of the contractor's yard are seen the reinforcing-steel fabricators at work in the foreground. In the right background are racks of completed piles. The gantry crane handled the reinforcing steel and the concrete bucket.

Contractors Set New Mark in Pile-Driving

(*Continued from page* 1)

new pile driver, but the job is being actively managed by the other partners.

Precasting Concrete Piles

The 20-inch concrete piles were precast in the Concrete Ship Constructors yard at National City, about 6 miles south of San Diego. This is the same yard which turned out "the Great Stone Fleet" (concrete ships and barges) during the war. The same gantry cranes which once carried prefabricated parts of concrete ships to the graving docks were used to pour these piles. When work began, on November 8, 1945, the contractors had 3,242 concrete piles to precast, totaling 213,000 linear feet. In addition, approximately 18,000 cubic yards of Class A concrete had to be placed in a beam-and-girder concrete deck on the two piers.

Steel reinforcement for the piles was figured on the basis of eight 1-inch round deformed steel bars, with ¼-inch spiral stirrups placed on 4-inch centers. A number of steel-reinforcement combinations were used, all of which equaled or exceeded the reinforcing-design requirements. Sometimes square steel bars were used. This juggling of steel was done to use up a considerable amount of various sizes of steel reinforcement on hand at the Base. It eased the demand on local steel contractors in southern California, many of whom have been hard hit by the wave of strikes in that industry.

Steel reinforcement was hauled to the yard by several heavy-duty low-bed trailers. The reinforcing material was then unloaded at a large fabricating apron by one of two Marion gantry cranes.

Eight fabricating tables were built on this apron, and a gang of four men to each table built up the steel. Longitudinal pieces were laid in place, the stirrups spaced and tied, and the finished reinforcing-steel framework was then picked up off the table by the gantry crane and stored for later use. Any steel picked up by the crane was supported from excessive bending by a triple hook-up. Three lifting hooks spaced equally on a 60-foot pipe carried the load. Ordinarily the steel had to be handled twice: once in storing it and once in putting it in the forms.

The concrete piles were poured in bays 45 piles long x 10 piles high, and allowed to cure a minimum of 30 days before they were used. The Concrete Ship Constructors yard set a wartime precedent for concrete-ship fabrication. It imported special lightweight aggregates to make a concrete so durable and tough that it reached a compressive strength of 5,000 pounds at 28 days. Since the specifications for piles are not that exacting, the contractors produced 3,100-pound concrete at 7 days with local aggregates and portland cement. The mix for piles was as follows:

Portland cement	658 lbs.
Sand	1,215 lbs.
Aggregate (1½ to ¼ inch)	2,050 lbs.
Water	27 gals.

This yielded 1 cubic yard of concrete, which was placed at an average slump of 2½ inches in a 12-inch cone.

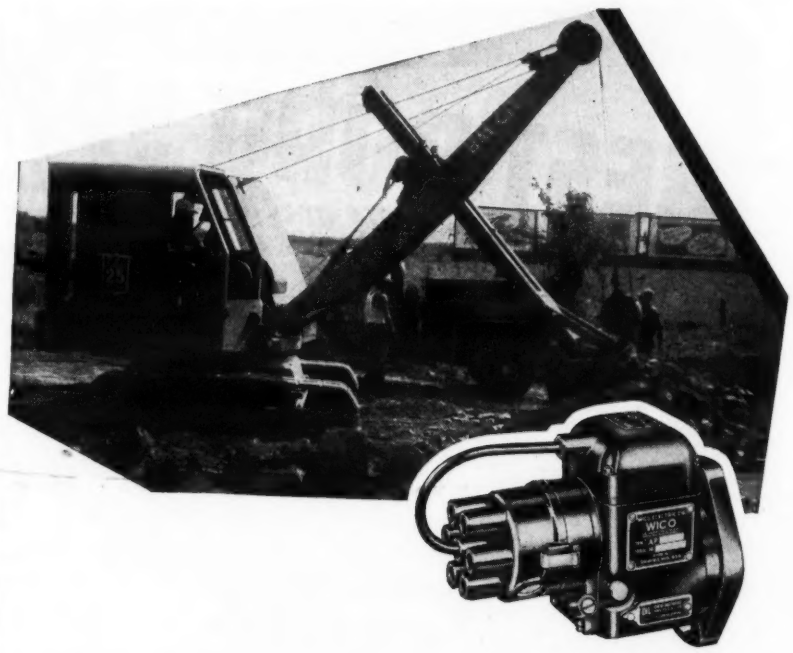
Precasting was stepped up considerably to keep pace with 30-pile-per-day driving records. The work was improved by March to the point where 45 piles were scheduled to be produced in 8 hours each day. This work was carried on by a single shift. A backlog of completed piling thus made it possible for the pile driver, at an average rate of 30 per shift, to be fully supplied.

Sequence of Operations

The precasting of piles followed this chronological sequence:

1. Early in the morning, the steel forms were stripped from the previous day's pour. These steel forms were rented from A. E. Troiel of Berkeley,

(*Continued on next page*)



Compact, tough **MAGNETO** *sparks this tough, compact rig*

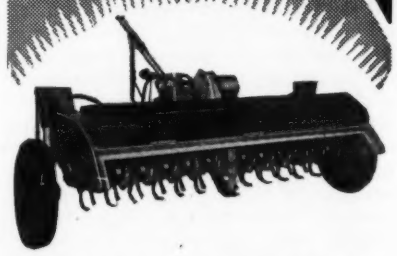
This Bay City half yard shovel is adaptable . . . it can also be used as a crane, dragline, or skimmer. The WICO Model AP magneto, used on many shovel applications, is equally adaptable. Like all other WICO heavy duty magnetos, it is designed for engines operating in continuous service and under adverse conditions. Produced for single, two, four and six cylinders and with either fixed or variable spark, it is readily adaptable to a wide range of uses.

For a dependable spark under the toughest of conditions and at low original cost, depend upon WICO—the world's largest exclusive producers of magnetos. More than a thousand authorized service stations are conveniently located throughout the country for WICO service and replacement of other ignition. Wico Electric Company, West Springfield, Massachusetts.

WICO
THE HEART OF YOUR ENGINE

BETTER WORK WITH LESS EQUIPMENT

ARIENS AGGMIXER



HERE'S equipment to be used with other general purpose road equipment that not only produces better work with less equipment but lowers the cost of work accomplished. For example, on roads such as illustrated, an average of a mile per day is mixed as compared with 2 miles every 3 days when graders only are used. Ariens AGGMIXER may be used wherever aggregates are used, such as all types of bitumens, cements, clays, chlorides, etc. The swirling, chopping action of the tines mixes these materials without displacing them on the road surface, and thoroughly pulverizes, mixes and aerates the aggregates with the binder used. Ariens AGGMIXER does a thorough job, rapidly, and economically—wet or dry . . . safe and easy to operate and adjustable to any tractor . . . simple and positive hydraulic adjustment for depth. Made in four sizes with normal cutting widths 4', 5', 6', and 7'.

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Contractors Set New Mark in Pile-Driving

(*Continued from preceding page*)

Calif. They were picked up by the gantry-mounted crane. Each form was set up on top of a pile.

2. The forms were then moved over by a form-setting crew, and aligned roughly. The bracework between each form was set.

3. The forms, and the bottom part of the pour (situated on top of the last tier of piles), were sprayed with paraffin solution to prevent the concrete from sticking.

4. The steel reinforcing mats were then installed by the Marion crane. Four mats were picked up simultaneously, and set in the forms beginning with the bottom mat. The steel was placed at this stage to prevent any of the paraffin spray from interfering with the concrete bond.

5. The steel forms were then finally aligned, and the top secured by 2 x 6-inch boards spaced on 5-foot centers. These boards were nailed to the wood backing on the steel forms, and the double-headed nails and boards were used over and over, as many as ten times. Alignment was made accurately by means of a string stretched from head to butt on the center line of the pile. The piles were lined up to be perfectly rectangular on a side, with no point at the butt.

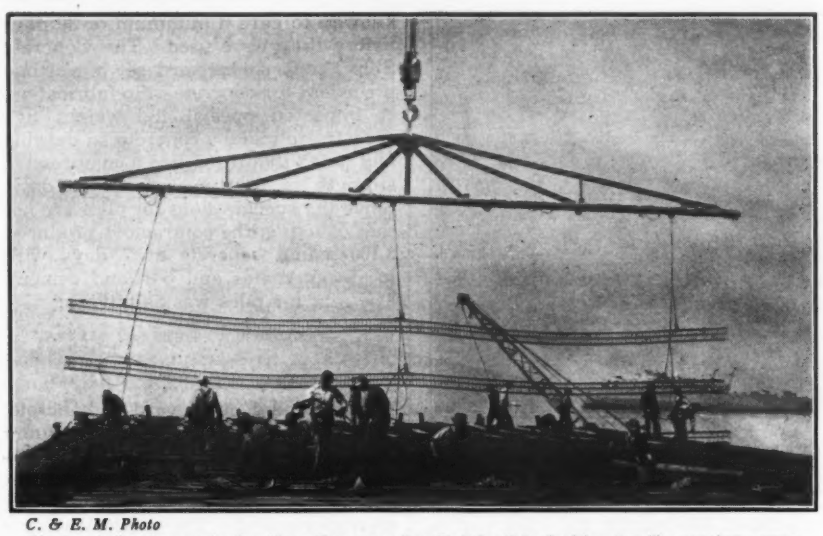
6. The reinforcing-steel mat was then lifted 3 inches off the previously poured piles. A shop-made crowbar device was used for this purpose, with a heel under the fulcrum point which rested on a cross board. As one man lifted the steel, another hooked a set of tongs from the top, which held the steel mat up off the floor of the pour and insured perfect clearance. A number of sections of 3-inch pipe in 24 to 40-inch lengths were then shoved down between the steel mat and the form, to give sufficient side clearance. These spreaders and the top supports were all installed on approximate 6-foot centers.

7. Concrete pouring then started. Dry-batch trucks, hauling from the batching plant outside the Concrete Ship Constructors yard, dumped their batches into the skip of a Koehring 27-E paver. This machine mixed the concrete 1½ minutes, and discharged into a 2-yard Gar-Bro bucket, which was then hoisted to pouring position by the gantry-mounted crane. Consolidation was achieved by means of two Viber electric vibrators. As each pile was completed, its top surface was given a steel-trowel finish.

The pouring sequence disclosed a certain interesting peculiarity. Because of the distance the gantry-mounted crane had to travel to get steel, and a certain congestion of equipment, the pours always started from one side of the group of piles and worked towards the opposite end. Invariably, then, pouring followed the same sequence. It was found that the piles tended to lean in the direction pouring was being done. A great deal of care, and timber spreaders between piles, was therefore necessary to keep the piles on top of each other. It was believed by the carpenter crew working there that a certain amount of time could be saved if the direction of pouring were alternated every other day.

On a group of 45 piles, approximately 3½ hours were necessary to raise the forms and align them for the next pour. A tier of 45 piles was poured in about 4½ hours.

After the piles had cured 30 days, they were picked up by the same crane which had poured them and were loaded on two 500-ton 38 x 130-foot barges. These barges were admitted to the graving docks near-by, where concrete ships had been built during the war. They were loaded to capacity by the 50-ton crane, and then towed across the bay to the site of Piers 6 and 8, where pile driving was done.



C. & E. M. Photo
Steel reinforcing mats for the piles were handled in this fashion by the gantry crane. Three lifting hooks equally spaced on a 60-foot pipe carried the load.

Pile Driving

The piles were unloaded by a 30-ton derrick barge, owned by Case-Connolly Construction Co. This derrick was equipped with a 100-foot steel boom, and was mounted on a wide, heavy hull. Its boom line was rigged 8-way, with a multiple-way load-line hook-up. It was extremely heavy, and the speed at which it unloaded piles was the governing factor in the speed of the pile driving.

The piles were picked up on the main hook of the derrick, by means of two 1¼-inch slings. Slings were hooked in the upper third of each pile in order to reduce stress on the butt end while they were being hoisted off the barge. Piles were spotted close to the driver by the derrick boom, and a line made fast from the pile driver. The 20 to 25-ton load was transferred from the derrick to the pile driver, with men working on the pier near-by under the most dan-

(*Continued on next page*)

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- Attaches to truck as tailgate
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C. & E. M. Photo
Workers bring the steel forms for the 20-inch precast concrete piles to proper alignment.

Contractors Set New Mark in Pile-Driving

(Continued from preceding page)

gerous conditions. Actually, however, with the job about 40 per cent complete when it was visited for CONTRACTORS AND ENGINEERS MONTHLY, no bad accidents had occurred.

This was partly due to the excellent quality of the wire-rope slings which were used to pick up and transfer loads so heavy that they creaked and groaned under the massive derrick boom. When he was questioned about the wire-rope slings, T. W. Eisenman, the Project Manager, said, "We have to make up all our own slings here on the job, and we find that preformed plow-steel cable is much easier to splice than non-preformed. Since we can't take any chances whatever on the safety factor of our slings, we must insist on their being the best in quality as well as of adequate size. You may say that all our wire rope which passes over sheaves is also preformed, for we use non-preformed rope only for standing lines such as supports for the leads, and so on".

All hoist cables on this job were certainly subject to shock loads, for the ocean swells sometimes jiggled heavy loads dangerously. The excellent safety record under these conditions is a tribute to the skilled management on the job, as well as to a good industrial product of which the slings were made.

The pile driver which handled the piles was named the "Carla". All the pile drivers Tavares ever built have been named. It is part of an ancient Chinese custom. Also, all of the pile drivers have been christened with champagne, with as much ceremony as if the occasion were the launching of a new battleship. This, too, is part of a custom.

In China, where Carlos Tavares grew to manhood, it was as important to christen the start of a construction job properly as to bid it properly. It was an ancient custom, before starting work on a job, to offer a sacrifice to the gods. A live rooster was often brought out, its throat cut, and fresh blood spilled on the first broken ground of the new project. Sometimes a ram or a goat was sacrificed. Who is to say, when Carlos Tavares christens a pile driver in 1946, exactly what traditions pass in review before his eyes?

The Carla is mounted on a wood hull, but all her superstructure is made of steel. In each side of the channels of her 100-foot leads, Tavares installed a telescoping water jet, to loosen the sand and make driving easier. This water jet on each side is composed of an 8-inch extra-heavy-duty pipe, nozzled down to 1¼ inches in diameter, and telescoping through a packed joint on to a 4-inch water main. The two 4-inch mains are fed by a 4-stage 2,000-gpm Byron-Jackson water pump driven by a 600-hp electric motor. The pump is a heavy-duty unit with brute force behind it.

The concrete piles were pulled up under the skirts of a Vulcan single-acting pile hammer weighing 10 tons, and as soon as they were belled they were dropped with the hammer. The twin jets were lowered along each side of the pile, and steam was turned on the pile hammer. The Vulcan hammer hit approximately 60 blows per minute with a huge steel ram weighing 9,300 pounds.

When the two batter piles of each bent were driven, the base of the leads was pulled to the desired slant by means of a 4-part cable hook-up with the front drum on the hoisting engine. The weight at the base of the leads was carried partly by rollers which traveled on the channel flange of a moonbeam quadrant. Driving batter piles interfered not at all with the functioning of the water jets and the pile hammer.

The desired bearing value of each of the 13 vertical piles in each bent is 60 tons. This will allow the required factor of safety when balanced against actual loading once the dock goes in service. It will be recalled that the standard *Engineering News-Record* formula for bearing capacity is as follows:

$$\frac{2\,WH}{S + 0.1} \text{ equals bearing value in pounds.}$$

The bearing capacity at San Diego, under the Navy's safety-factor formula, was calculated from this simple abridgement:

(Continued on next page)

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Harder than No. 20, it's for parts subject to rolling or sliding abrasion, batter and impact. Applications include tractor treads, drive sprockets, cams, crusher hammer, etc. Rockwell C hardness 35-40.

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For high resistance to impact, heat, corrosion, abrasion. Deposit work hardens under impact. Use on high carbon manganese cast steels. Rockwell C hardness 25-35

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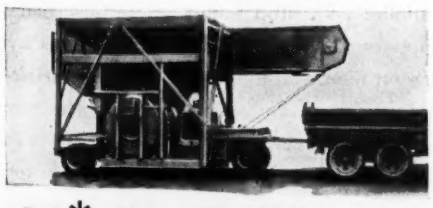

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Up to 30 cu. yd/hr depending on mixing time.

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Full 3/4 cu. yd. with 10% surcharge capacity.

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20 Cu. Yd. heaped 3 equal compartments.

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60 Tons/HR handling material weighing 100 lbs. per cu. ft.

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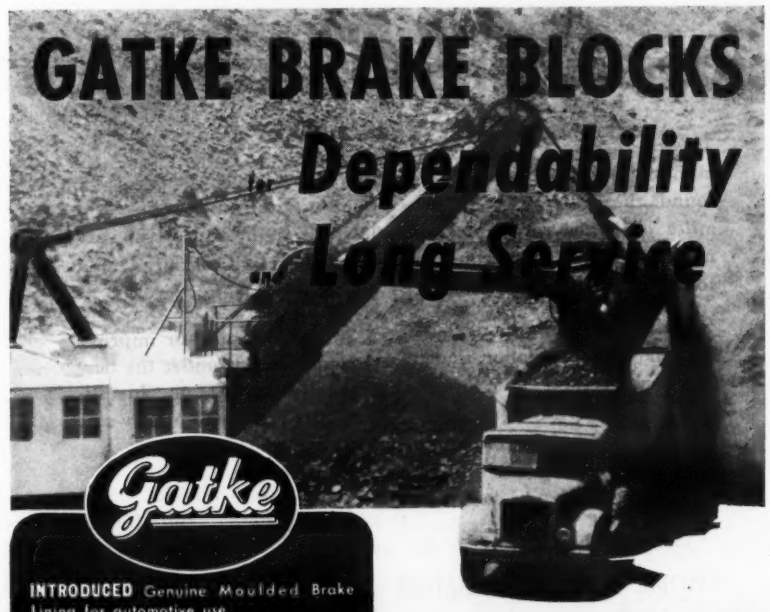
BUCKETS • AGGREMETERS • PORTABLE CONCRETE PLANTS



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Contractors Set New Mark in Pile-Driving

(*Continued from preceding page*)

$$\frac{2\,WH}{S + 0.3}$$ equals bearing value in pounds, where

W equals the weight of the striking ram in pounds;
H equals the distance of fall in feet;
S equals the distance in inches of penetration per blow.

The bearing value for each pile was thus figured at the hammer, and no subsequent loadings were made.

As soon as the pile bents were finished, a bracing crew started to work. The top of each pile was pulled to exact alignment by means of Ingersoll-Rand air hoists and cables. This was not too difficult, because in driving the piles a special floating template with notches cut on the proper centers was used in front of the Carla. With 30 feet of water under the pier, the piles pulled over to line readily.

Each bent was braced by a 6 x 12-inch timber placed along each side of the bent 5 feet 10 inches above low tide. These timbers were secured by four 1-inch round bolts, placed two on either side of the pile. The holes were drilled by Ingersoll-Rand augers. The skin friction of these timbers against the piles will support the deck forms for concrete, but as a factor of safety a metal strap was anchored from the wale to the top of each concrete pile.

Preparation for Deck Pour

Each pile must protrude 4 feet into the deck. The top 4 feet of concrete was removed from the steel reinforcing of each pile by drilling jackhammer holes, loading the concrete with ⅓ stick of 20 per cent gelatin in each of four holes, and blasting. When the deck is poured, the supporting piles will then become part of a monolithic structure. Compressed air is used extensively in shaping up the pile tops for pouring. Ingersoll-Rand impact wrenches tighten the bolts on wale bracing, augers drill holes, and air hoists pull the heads of piles in line.

The same steel forms which once were used to pour concrete ships during the war have been adapted to fit the bottom of the concrete deck. The contractors are also doing some shipyard prefabricating, the like of which has not been seen before on west-coast harbor work. A formed tunnel to carry utilities along the south side of the new piers was prefabricated in sections in the shipyard, stripped where it was accessible, and hauled out in sections to the job. One of these prefabricated tunnels was set between each pile bent, and the protruding steel reinforcement was welded to the pile steel to make one monolithic mass. The extremes of tide at Piers 6 and 8 would have made it necessary to work on the forming of these tunnels at rare intervals, had the sections not been prefabricated.

C. & E. M. Photo

This view of driven piling shows the unusually sharp batter of the 25-ton brace piles, as well as blasted piling and the compressed-air header for jackhammers, air augers, and the hoist used for alignment. In the foreground are drilled and loaded holes to remove the top 4 feet of concrete so that the reinforcing will extend 4 feet into the deck of the pier.

Transformer vaults, designed to be set at a bottom elevation of minus 1.6 feet below low tide, were cast in the yard, stripped, and *floated* out to the pier. They were floated in at low tide and secured when the blue Pacific adjusted them properly to elevation. When finished, the pier-deck will be at an elevation of 12 feet above low tide.

Job Records

Concrete Ship Constructors, T. W. Eisenman, and Case Construction Co. have demonstrated the feasibility of

(*Concluded on next page, Col. 2*)

25,000 Miles of CALCIUM CONSOLIDATED ROADS show the way

Hundreds of communities have found the way to get more miles of better roads for less money with calcium chloride for surface consolidation.

Such roads are built of local materials, by local labor, under local supervision and, when consolidated with a moisture bond provided by calcium chloride, are real, scenic highways—smooth and dust-free.

The road shown has been in service for eight years as a secondary state route. Its cost was low, its maintenance cost very low. Its surface is firmly bound and long-wearing.

When you build or improve secondary roads under the new Federal-Aid program, investigate this high type of low-cost road.

Ask for our booklet, "Surface Consolidation and Maintenance with Calcium Chloride."

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Stop GERM SPREADING PRACTICES!

Protect the health and strength of your workmen on jobs where *fresh, clean, cool drinking* water is not available . . . stop using unsanitary pails, kegs, dippers and cups. Save payroll losses by keeping your men on the job! This portable drinking fountain (the same as used during the war by the Armed Forces, all over the world) will help you do all this by providing protection for your workmen from disease, colds, etc. which otherwise easily spread when a "common" drinking cup or dipper is used.

Inner water container and bubbler parts made of corrosion-proof stainless steel or plated brass. Four gallon capacity tank, fully insulated to keep water *fresh* and *cool*. A few strokes with the pump supplies compressed air for instant flow of water at the press of a button. Meets requirements of Public Health Authorities!

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No. 18—Dobbins Superbilt *Portable Drinking Fountain*, less all accessories. Only..... $12.50
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ELKHART, INDIANA

The Worthington 1946 mower tractor is now equipped with a Monroe hydraulically controlled spring seat to eliminate jolts and jars for the driver and permit higher mowing speeds.

The Bumps Taken Out Of Tractor Driving

"Dead-end" tractor-mower drivers can sit up and see a new day coming. And we mean "sit up" literally. In a joint announcement, the Worthington Mower Co., Stroudsburg, Pa., and the Monroe Auto Equipment Co., Monroe, Mich., have revealed that 1946 Worthington mower tractors are being equipped with the new Monroe easy-ride seat.

It combines a double-action hydraulic shock absorber, a variable spring, and a sway bar. The cushioning effect of the seat spring is controlled by the hydraulic shock absorber which levels out the ride regardless of rough terrain or the weight of the driver. The sway bar prevents side sway and insures the driver a steady, even ride. All three help smooth out the bumps, jars, and shocks which give tractor drivers a rough time.

Worthington engineers claim that higher speeds in mowing will be possible. Monroe promises less fatigue and fewer backaches. And the seat is said to keep the operator from being catapulted out of the vehicle if it runs over a bump, rock, or other obstacle.

Aerial-Survey Equipment

Equipment for aerial photography, from pocket stereoscopes and cameras to the very airplanes themselves, is shown in a catalog issued by the Abrams Instrument Corp. of Lansing, Mich., and Washington, D. C. The firm carries a complete line of precision photogrammetric equipment. The Abrams organization also conducts an aerial surveying division that is equipped to make aerial surveys in any part of the world. Copies of the catalog are available on mention of this notice.

Contractors Set New Mark in Pile-Driving

(*Continued from preceding page*)

prefabricating parts in a central yard in the best Henry Kaiser manner. Carlos Tavares, with his design of the Carla has boosted the average number of piles per 9-hour shift from the old average of 15 to 30. Several times that number has been exceeded. It is quite an accomplishment to pick up a concrete pile weighing 25 tons, spot it, and drive it to 30-foot penetration in 5 minutes. It is possible to do this with Tavares' new rig. The limiting factor seems to be the slow-moving derrick barge, which requires about 10 minutes to handle a pile from the barge to the Carla.

Job Personnel

Naval personnel on the project, which is known officially as Navy Contract NOY-13258, are as follows: Captain A. K. Fogg (CEC), USN, is the Officer in Charge of Construction, 11th Naval District, with Commander William L. Sawyer (CEC), USNR, as Resident Officer in Charge.

Terry W. Eisenman, who developed a mud flat below San Diego into a busy shipyard for Concrete Ship Constructors, is the Project Manager. Messrs. Elliott, Stroud, Seabrook, and Tavares are also on the job, for all of them are men who like to get their boots muddy. Art Summers is General Superintendent. Mat Hongola was in charge of pile precasting, Bill Pace in charge of pile driving, and Ralph Denny in charge of bracing the pile bents preparatory to the deck pour.

Concrete Houses Cast In One Complete Unit

A possible source of activity for general contractors and even road builders is revealed by R. G. LeTourneau, Inc., in a new illustrated folder, Form G-1082. The brochure explains the step-by-step procedure used in building complete concrete houses with the Tournalayer.

This machine, developed at the firm's Longview, Texas, plant, will precast in one piece the basic structure of a 4-room concrete house. LeTourneau has developed the Tournamixer and the Tournacrane to complete the house-building process. All three machines are described in the 8-page brochure.

This machinery will be leased, not sold, LeTourneau says. It is intended primarily for use on mass-housing projects. Complete information on demonstration, rental terms, and specific delivery schedules can be obtained from the Tournalayer Division, R. G. LeTourneau, Inc., Longview, Texas.

Joins Worthington Staff

George E. Gates, prominent in construction-equipment circles in the west, has been appointed to the San Francisco staff of the Worthington-Ransome Construction Equipment Division of Worthington Pump & Machinery Corp.

Available for
INTERNATIONAL Models I-4 and I-6
ALLIS-CHALMERS "WC" with wide front wheels
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Lifts 3,000 Pound Load 8 Feet

The "Ottawa" INDUSTRIAL Hydraulic Front-End LOADER is a HEAVY DUTY Machine . . . it lifts 3000 pounds of Sand, Gravel, Rock, Coal, Steel Pipe, Dirt or Other Bulk Materials to a height of 8 feet quickly and easily . . . it assures operator perfectly CLEAR VISION at all times, is quickly and simply ATTACHED or DETACHED and is SHIPPED COMPLETE (there's absolutely nothing additional to buy or add) with complete HYDRAULIC SYSTEM including pump and valve. Bulldozer blade, Snowplow and Boom attachments are available. Write or wire today for FREE ILLUSTRATED FOLDER and prices. Immediate shipment.

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Elliott's LIN-O-BLU Ammonia Developed papers should be used by you. They are a STAR PERFORMER everytime. Available in thin, medium or heavy weights. Write for testing samples. Address Dept. L-7.
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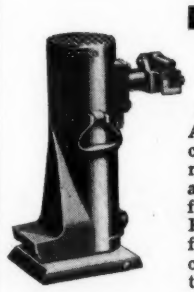
and TRENCH BRACES



HEAVY DUTY SCREW JACKS
Capacities: 15 to 50 Tons
Also available in higher capacity types, these rugged, dependable jacks are particularly suitable for rough outdoor use. Equipped with foot-lift for low loads, convenient carrying handles. The 50-ton sizes are designed with

AUTOMATIC LOWERING JACKS
Capacities: 5 to 25 Tons
For all general lifting service, these general purpose jacks are equipped with the Genuine Barrett Automatic Lowering Mechanism.
Handy for all types of work, they are strong, easy to operate, equipped with foot-lift for low loads.

STEEL TRENCH BRACES
Ideal for trench bracing work, Duff-Norton Trench Braces speed up shoring work and prevent cave-ins. Available as complete units, as illustrated, or as separate fittings, and for attachment to timbers.

A JACK FOR EVERY JOB
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PITTSBURGH, PA.
Canadian Plant: COATICOOK, QUE.
There Is A Distributor Near You

The new Dumpcrete for transporting concrete from mixing plant to job site and delivering it to the forms is made in two sizes. The larger Model 4C mounted on a standard 5-ton truck is shown above in dumping position.

Dump Body Handles Ready-Mix Concrete

Transporting air-entrained concrete by dump truck from central mixing plant to job site is made possible through a piece of new equipment announced by the Maxon Construction Co., Inc. The unit comprises a specially designed dump body mounted on a standard truck chassis.

The body, called the Dumpcrete, is built in two sizes, one for handling 2 cubic yards of concrete, the other for 4 cubic yards. These have struck volumes of 3½ and 6¼ yards respectively. The body is raised by hydraulic hoists to a dumping angle of 90 degrees when discharging its load onto the concrete chute. This angle, and the fact that all corners in the truck body are rounded and all welds ground smooth, make for a fast clean discharge, Maxon says.

All-welded high-tensile steel is used in the manufacture of these dump bodies. The smaller weighs 1,700 pounds without the tail-gate and chute, and the larger 3,400 pounds. Concrete can be discharged as high as 6¼ feet with the larger size and 4¼ feet with the smaller. An adjustable baffle, deflector plates, and an inverted center keel provide a discharge similar to that of a bottom-dump bucket.

Included as standard equipment with each model are a specially designed gate, a hopper for directional discharge, and two sections of chute, one 5 and the other 5½ feet long. The gate can be removed when the truck is hauling materials other than concrete.

Operation of a Dumpcrete is said to result in lower concrete costs. The manufacturer attributes this to reduction in transit and discharge time; to greater payloads; and to the low initial cost and the little maintenance required.

The Dumpcrete is illustrated and described in a specification folder available to readers of this magazine on mention of this notice. Write the Maxon Construction Co. at Dayton 2, Ohio.

Diesel Nozzle Tester

All makes and models of diesel nozzles and injectors can be tested with the Buda Universal nozzle tester, its manufacturer says. A full description and photographs of the unit in use are displayed in a new folder, Form 1238. Copies of the folder can be obtained by readers on mention of this notice. Write the Buda Co., Harvey, Ill.

Pipe Driver Powered By Pavement Breaker

Pipe can be driven under abutments, pavements, and other structures, without ripping up any construction, by means of a new device offered by the Atlantic Steel Co. This pipe driver is powered by an ordinary pneumatic pavement breaker.

The Atlantic pipe driver comprises three parts: a driving head, a driving point, and a shank. The driving point is inserted in one end of the pipe to be placed, the driving head in the other, and the driving shank in the pavement breaker. A universal joint between head and shank allows the pavement breaker a wide working angle in confined spaces.

Said to drive 2-inch pipe at speeds up to 25 feet per hour, the pipe driver is built of selected heat-treated steel. It weighs only 8 pounds, and is made in sizes to fit 1 to 2-inch standard pipe. Special sizes are available for extra-heavy pipe. Hexagonal 1⅛ and 1¼-inch shanks fit standard pavement breakers.

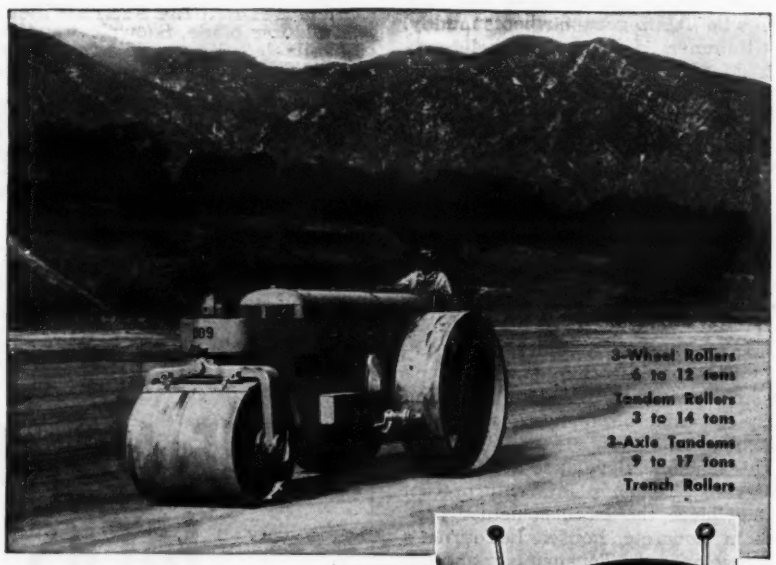
More complete details about this new pipe driver can be secured on mention of this notice. Write the Atlantic Steel Co., 1775 Broadway, New York City.

Wire-Rope Clip Data

How to make wire-rope fastenings, using Crosby clips, is described on a pocket-size card issued by the American Hoist & Derrick Co., St. Paul 1, Minn. The card shows the application of the clips, gives the minimum requirements for various rope sizes, and lists hints for successful wire fastening. Ask for Form CCB-21, available on mention of this notice.

you can tell . . .

IT'S A BUFFALO-SPRINGFIELD!



You can tell a lot by the "looks" of a piece of equipment. The smooth, compact appearance of a Buffalo-Springfield Roller is the outward evidence of leadership in design. Look at the control panel at the right. Just one of the "fine points" on a machine where no part is considered too small to get painstaking engineering attention. Ask your distributor for literature.

BUFFALO-SPRINGFIELD

The Buffalo-Springfield Roller Co.
Springfield, Ohio

The Oldest and Largest Builder of Road Rolling Equipment in America.

88% EASIER LIFTING

It's a fact that

SIMPLEX BALL-BEARING SCREW JACKS

. . . reduce effort 88%. Self-leveling cap floats 9 degrees on *single* chrome-moly steel ball. No ring of small balls to flatten when load is not centered. Operator output boosted.

It pays dividends having plenty of Simplex Screw Jacks—moderate cost. 19 sizes with 4-way head, 9 sizes with ratchet head. 5 to 24 tons capacity.

TEMPLETON, KENLY & CO.
Chicago 44, Illinois

BETTER, SAFER JACKS SINCE 1899

SIMPLEX
WORLD'S MOST COMPLETE LINE OF
JACKS
LEVER
SCREW
HYDRAULIC

A MOUTHFUL at EVERY BITE

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

This is not only the claim of OWEN, the name symbolic of the highest grade Excavating and Handling Buckets for years. — Operators everywhere, "on and off" the job, volunteer this testimony.

And — there's a reason. Owen-engineered buckets incorporate special features which have been continually improved.

Branches: NEW YORK PHILADELPHIA CHICAGO BERKELEY, CAL.

THE OWEN BUCKET CO.
6030 Breakwater Ave. • Cleveland, Ohio

and MORE BITES PER DAY

Help Fight Famine!

Give canned food or money to buy food to your local committee of the Emergency Food Collection.

The new Page reversible dragline tooth point has new design features to increase its service.

Dragline Tooth Point

An improvement in the design and construction of tooth points for dragline service is claimed by the Page Engineering Co. for a recently announced reversible center shank tooth point. The point is said always to remain firm if a 25 per cent minimum bearing is maintained on the stub ends and on the shank above and below the bolt head. A new hook bolt fastening, designed to keep the bolt from wearing or tearing loose, features the new point.

Details on these new dragline tooth points can be secured by writing the Page Engineering Co., Clearing Post Office, Chicago 38, Ill. Just mention this news item.

Perelle Heads Gar Wood

Charles W. Perelle, who rose from $175-a-month tool designer's job to become a $75,000-a-year airplane manufacturing executive in the space of 7 years, has been elected President of Gar Wood Industries, Inc., Detroit, Mich. He succeeds Glen A. Bassett, retired. Mr. Perelle is a former Vice President of the Hughes Tool Co. and of the Consolidated-Vultee Aircraft Corp.

Tractor-Loader Lifts Up to 1,000 Pounds

Highway maintenance, roadside development, and contracting jobs that require the handling of light loads can be facilitated by a Da-West loader, the manufacturer claims. This hydraulic unit is adaptable to most small wheel tractors. It has three interchangeable attachments—sweep rake, scoop, and fork—which permit a wide variety of applications.

The shovel unit will scoop and lift 10 cubic feet of earth 8 feet high in 10 seconds. It has sufficient clearance for dumping into the average wagon, truck, or bin. The sweep-rake-stacker attachment will lift a 1,000-pound load as high as 13 feet. It has a loss of but 3 feet when dumping.

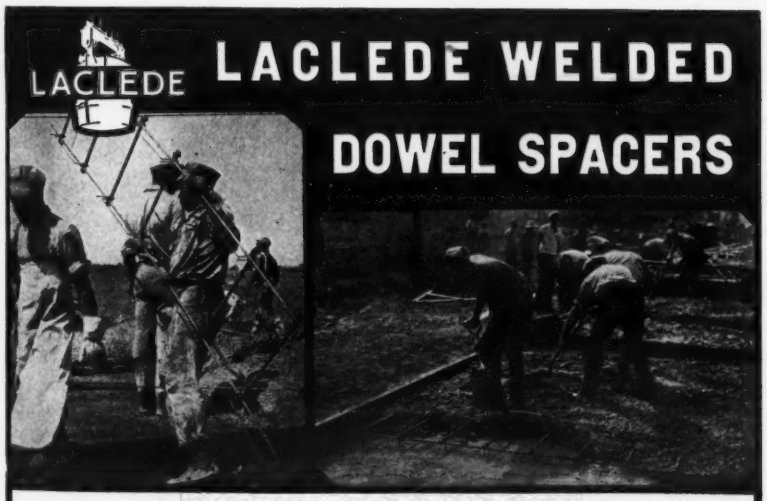
Full details on the Da-West loader can be obtained on mention of this notice. Write Davis-Westholt, Inc., 1521 McLean Blvd., Wichita 12, Kans.

Build Your Own Welder

On the grounds that "puttering is an American virtue", Hobart Brothers Co. offers a new 48-page book, "How to Build Your Own Gas Drive Welder". The book is available without cost to readers of CONTRACTORS AND ENGINEERS MONTHLY.

Photographs, diagrams, and easily read text take the reader through the various steps necessary in building a welding outfit in the shop. The welding unit, engine, radiator, frame, trailer, and other components are discussed.

Copies of the book, EW-113, can be obtained by mentioning this notice. Write Hobart Brothers Co. at Troy 1, Ohio.



RIGID—ACCURATE

FOR CONTRACTORS, LACLEDE DOWEL SPACERS provide a light weight, economical method of placing dowels and joints. Distribution bars, supports, and dowel sleeves are all welded into one integral unit for rapid joint assembly. Shaped tie wires accurately locate fibre or steel joint materials.

FOR ENGINEERS, LACLEDE DOWEL SPACERS provide a rigid, accurate, prefabricated assembly for holding each end of each dowel in exact location. Both horizontal and vertical alignment of the dowels can be maintained on even the most irregular subgrades within limits prescribed by highway engineers.

LACLEDE STEEL COMPANY
ARCADE BUILDING SAINT LOUIS 1, MISSOURI

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Change of Address

(Mail to Contractors and Engineers Monthly, 470 4th Ave., New York 16, *today*)

From _____
(Former address)
To _____
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(New address)
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Name _____
Firm _____
Position _____

LA CROSSE TRAILER CORPORATION LA CROSSE, WIS.

Contractors and Engineers Monthly

TOURNAPULLS handle 500,000 yds. TOUGH MATERIAL on STEEP GRADES

40 to 50% downgrades, 27% adverse return grades, all in a day's work for Nate Moore's 9 TOURNAPULLS

To provide fill for a building site at Camp Pendleton, Oceanside, California, Nathan A. Moore is using 9 Tournapulls to move 500,000 of his estimated 700,000 cubic yards, under conditions that are really rugged.

Sandstone-Clay Ripped out of Mountainside

Borrow is located on a mountainside, ½ mile from fill. Material is sandstone mixed with clay, heavy but dry, rooted for fast loading. Tournapulls are pusher loaded in 75′, taking one minute average to heap to the spring pipe. Despite voids, loads average better than 11 pay yards.

Part of the loads (about 10 to 15%) were taken down the mountainside over a 500′ ramp. Started at 50% grade this had been worked down to around 40% when these pictures were taken.

Return haul includes 0.2 mile of 27% adverse grade, climbed by Tournapulls in 2nd gear.

Fleet output 99 loads in 2 hours

During a two hour time study the 9 Tournapulls delivered 99 heaped loads to the fill on the 1 mile round-trip haul, a total of 1089 pay yards. Confirming this figure as conservative is the claim of the job superintendent that the Tournapulls are placing 6,000 yards on the fill each 9-hour shift.

Check Tournapull estimate on your jobs

Considering grades encountered and type of material loaded, this job performance is typical of field evidence coming in daily to show what Tournapulls can do to give you lowest-net-cost-per-yard under your job conditions. Your nearest LeTourneau Distributor has facts and figures that will interest you. See him today!